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Manufacture of Precious Stones.

AN address on clay and its economic application was delivered by Prof. T. C. ARCHER on the occasion of the inaugural meeting of the fifty-fourth session of the Royal Scottish Society of Arts at Edinburgh.

The president commenced by a reference to alumina and its various alloys. One of the greatest discoveries of the present age, he said, was the obtaining of the oxide of alumina in a pure crystalline state. It had long been known that the precious stones were composed of oxide of alumina colored by other metallic oxides; and it was a very fair inference that if they could succeed in melting the oxide of alumina, there was nothing in the world to prevent the manufacture of emeralds, sapphires, rubies, etc. This had actually been accomplished by a Parisian chemist, and the artificial gems were of the same hardness and density as, and chemically identical with, the real stones. Beautiful stones were exhibited, after which the Professor proceeded to explain the composition of the various kinds of clay, and to detail the uses to which they had been put from the earliest periods of history. He spoke also of the restoration of the lost art of encaustic and mural tile making, and described how those beautiful ceramic articles were manufactured, and the manner in which they were salt-glazed. The introduction of this kind of ware into the building of houses would, he said, add much to the beauty of our architecture—the more especially as the atmosphere had no effect upon their coloring, as in the case of serpentine and even granite. He next touched on the application of salt-glazing clay to sanitary appliances and gas retorts, and concluded by a reference to the improvements made of late years in the construction of pottery-kilns, which had the effect of saving fuel to the extent of one-third.

Gunpowder Experiments.

CAPTAIN NOBLE and Mr. ABEL have come to a definite stage with their experimental researches into the action of fired gunpowder, and have embodied their conclusions in a report of the Proceedings of the Royal Society.

Their objects they state to have been:—(1) to ascertain the products of explosion when fired in guns and mines; (2) to investigate the tension; (3) the effect of various sizes of grain; (4) the variation caused by various conditions of pressure, comparing explosion in a closed vessel with that in the bore of a gun; (5) the volume of permanent gas; (6) the heat; (7) to ascertain the work performed on a shot in the bore of a gun. For this very careful experiments were carried out to ascertain the pressure, volume of permanent gas, heat, and analysis of gases and solid products. A vessel of mild steel, tempered in oil, was used, completely closed with a closely-fitting screw firing plug, through which were led circuit wires with fine platinum wire enclosed with mealed powder, which it fired when heated by the current of a Daniell battery.

The results were briefly as follows:—The pressure was registered by Captain NOBLE'S crusher gauges at from 1 ton to 36 tons per square inch. The analysis of the gaseous products showed a regular change, due to variation in pressure, carbonic anhydride increasing, with a decrease in carbonic oxide, as the pressure increased. The solid products were subject to greater and less regular variation; speaking generally, the chemical action is more complicated than has been supposed, and the old fundamental equations are found to represent it very imperfectly. More carbonic oxide and potassium carbonate, and less potassium sulphate than has been thought is produced. Potassium sulphide is thought to be formed primarily, but eventually it is not present in any considerable quantity, having given place to potassium hyposulphite. The temperature of explosion is found by means of platinum wire or foil to be about 2200° Cent. About 35 per cent. of the heat generated is communicated to a small arm, and but 3 per cent. to an 18-ton gun. The products of explosion consist of about fifty-seven parts by weight of solid to forty-three of permanent gas. When the powder fills the space in which it is fired the pressure is about 6400 atmospheres, or 42 tons per square inch. The products of explosion generally are the same in a gun and in a completely closed vessel. The work on the projectile is due to the elastic pressure of the permanent gases. These results have only been obtained by a long and laborious course of very carefully conducted experiments. They are very valuable, and such as but very few individuals have the means of carrying out.—*Engineering.*

Mining Clay.*

By Prof. J. C. SMOCK, Assistant Geologist of New Jersey.

The primitive mode of mining clay by open workings, in which the overlying beds of earth (commonly termed the "bearing") were removed, and the clay then dug out by sinking shallow pits, is still the prevalent and almost universal mode of extraction. This is particularly true of our Cretaceous and Tertiary clays, which are generally earthy in character, and but slightly covered by drift and alluvium. The most accessible beds in many of our clay districts have been worked out, and clay miners are compelled to search for new outcrops, or to remove thicker beds of top dirt or bearing. Under this stimulus subterranean working, or mining proper, has been suggested. A brief notice of this new mode, as employed by Mr. OTTO ERNST, near the head of Chesquake's Creek, three miles south of South Amboy, New Jersey, is here presented for your consideration.

Previous to mining, the old mode of extraction—digging pits—was found to be too expensive, in consequence of the heavy amount of top dirt and the excessively large amount of water in these overlying porous strata. For some time the locality was abandoned, until Mr. ERNST came in possession of the property, and began *mining* the clay.

The mines are in a flat, bordered on three sides by higher ground, and on the fourth opening into tide-water meadow. The mouths of the two working shafts are 31 and 27 feet, respectively, above high water level. The surface a few rods from them is about 40 feet higher. The geological section, made by combining the outcrops seen in these surrounding hillsides, and the beds passed through in the shafts, is as follows:

1. Soil.
2. Moulding sand and sandy earth.
3. White quartz sand in very thin layers, alternating with light-colored, sandy clay, 40 feet.
4. Black, tenacious clay, containing pyrite and lignite, 5 feet.
5. Dark-colored clay, very sandy towards the bottom, 6 feet.
6. Bluish white potters' clay, 18 to 20 feet.
7. Dark-colored quartz sand.

The *bearing* in the flat varies from 12 to 22 feet, so that the greater portion of the potters' clay bed is below high water level. Under the surrounding hills it is about 60 feet.

The mining *operations* have been the sinking of vertical shafts, and then the removal of the clay by a system of horizontal drifts. The shafts stop in the clay stratum. On account of the very wet and porous beds of sand and sandy clay over it, the sinking of the shafts was attended with much difficulty. They had to be water tight. To do this the cribbing was doubled, and the intervening space was carefully filled with the best of clay, rammed down hard. This clay filling has been found efficient and, so far, enduring. From the shafts working tunnels have been cut, slightly rising, in order to allow easy drainage and to assist the loaded cars running to the bottom of the shafts. Some of these main tunnels have been cut in 500 feet. They are about eight feet wide and from eight to ten feet high. In driving these, as also in removing the clay from the side drifts, the boring auger is in constant use to ascertain how much clay is in front, as a thickness of five feet is always left below for flooring, and the same overhead for roof. This is rendered all the more necessary by the irregularities in the surface of this potters' clay stratum, sometimes amounting to differences of 10 to 14 feet from a horizontal plane in a distance of as many rods. To support in part the roof, the ordinary mode of timbering horizontal drifts is employed, the uprights or props with their corresponding sleepers or collars being set from a foot to eighteen inches apart. In some places, for extra security, they are set closer, or they are doubled. Logging on the sides keeps up the sand filling where the clay has been removed. From the main drifts *laterals* or side drifts are cut at right angles to the former and parallel to one another.

In these the timbering is not so substantial, its object being the temporary support of the roof while the cutting goes forward. Generally the timbering follows closely the extraction of the clay, rarely leaving more than five feet of roof in advance unsupported. As soon as one of these laterals has attained the proposed

* A paper read before the American Institute of Mining Engineers at the Hazleton Meeting, October 27th, 1874.

length, it is filled with sand brought from the surface, and a few yards only from the mouth of the shaft. A second side drift or tunnel is then cut, removing the clay quite to the first, and thus the work of extraction and filling goes on to the further end of the working or main tunnel. These side drifts are rarely more than 75 feet long. One main serves thus for the excavation of the clay from a width of 150 feet, or from an area of 500×150 feet, or nearly two acres. Owing to the earthy nature of both the roof and the floor and the weight of the *bearing*, sinking and *creeps* occur, ultimately shutting up the most carefully timbered tunnels. In practice these serve about a year, but this is generally sufficient for the removal of the clay from both sides of it. A second belt is then opened from a new shaft and tunnel. The sand filling has been found quite essential to economical mining, as it prevents the cracking and fissures through which, either in the roof or in the floor, water and quicksand would soon flow in and fill the mine. In a word, this sand filling completely replaces the clay, making the series of beds almost as solid as they originally were, and accidents from such breaks have but rarely happened. The greatest source of danger is in getting too near the adjacent sandy beds, and thus letting in the water. Hence the constant use of the auger to know what is ahead.

The clay is removed in cars running on tracks which, in the lateral drifts, are temporary, being taken up and laid in the next drift, when one is finished. A more permanent track is laid in the main tunnel, and on this the loaded cars are pushed to the shaft. Here they are emptied into buckets, which are hoisted by horse-power to the surface.

The ventilation is effected by a double shaft, with a fire at the bottom to aid in producing an upward current of air. As the amount of water is very small (the whole mine being within the potter's clay stratum), a small pump suffices to raise it.

This mode of mining clay has been successfully employed by Mr. ERNST for several years. With further improvements in enlarged workings, in the modes of under-ground transportation, the hoisting and the pumping, greater economy might be obtained. As it is, he gets a superior clay, since there is no mixing with over-lying top dirt or inferior clays. Then there are no interruptions caused by slides, inclement weather, &c., common to open workings. In addition to those advantages, the mining goes on night and day, thus doubling the capacity of the same area in a given time.

One disadvantage will be evident at once. For every 8 feet of clay taken out, 10 feet (5 feet below and 5 feet above) is left. But, as the area of clay land is yet large, this is not so serious nor objectionable.

The rapidly diminishing area of clays at depths easily accessible by open diggings, and the increasing value of superior clays to meet the large demands in making fire-brick retorts, sewer and drain pipes, and the manifold forms of pottery, demand greater economy in mining them, and this mode, so successfully employed, ought to be more general, for it would extend vastly the workable areas of valuable clays and thus contribute to our mineral wealth.

The Metallurgy of Bismuth.

THE ore treated at the St. Denis works is from Sucre in Bolivia. It consisted of:—

Bismuth	22.80	per cent. to	30.05	per cent.
Iron	10.20	"	16.90	"
Copper	9.50	"	12.15	"
Sulphur	19.50	"	16.90	"

Also small amounts of antimony, lead and silver. The ore is first roasted at low red heat, in a reverberatory furnace for twenty-four hours, a little pulverized charcoal being thrown in from time to time. It is then mixed with three per cent of charcoal and a flux composed of lime, sal-soda, and fluor spar. This is treated in a reverberatory furnace, with a basin in the hearth to receive the metal and slag. A reducing flame is given for about two hours, the mass being frequently worked over; then the doors are opened, and the heat is raised to whiteness until the mixture is perfectly liquid, which takes about two hours. The entire mass is then run off into a cast-iron pot and cooled. Three layers form, the lower consisting of metallic bismuth, the middle of a mixture of bismuth and copper sulphides, while the upper consists of a vitreous scoria containing the iron, etc. The crude bismuth contains two per cent. of antimony, two per cent. of lead, and traces of silver. The mattes containing five to eight per cent. of bismuth are treated as the ore has been, *i. e.*, roasted and again fused with flux. The mattes from this second operation contain one to two per cent. of bismuth, which must be treated in the wet way. The experiment of breaking up the matte, mixing with iron filings and scoriæ, fusing in reverberatory furnace, and then casting was tried; the result being a mass of bismuth below, and a copper matte above, but the iron slag attacked the hearth of the furnace. The process above described was found to be better in this respect, a little silica being added in the second treatment to replace the quartz gangue of the ore. The bismuth is refined from antimony by fusion at red heat with nitre. Copper, lead, and silver are removed by the wet way.

A bismuth ore from St. Angel, France, containing a mixture of wolfram and, bismuth oxides, was treated successfully by the wet way as follows: After pulverization it was digested twice with hydrochloric acid. The acid liquors were run off, partly neutralized with soda, and then highly diluted. The precipitate of oxychloride was then separated, washed, and reduced by contact with iron plates, the "cement bismuth" being finally fused with an alkaline flux. The metal thus prepared was found to contain traces of lead and silver. The portion of the mineral insoluble in hydrochloric acid was calcined at red heat with sodic nitrate. The product yielded sodic tungstate, on lixiviation with boiling water.—*American Chemist.*

Peat Mining in Canada.

THE difficulties in utilizing peat as fuel have been widely discussed, but the operations at La Pigéonnière, Canada, have, by ten years' practical operation, proved the practicability of converting the substance into a clean and cheap fuel, the supply of material for which is, in many localities, practically unlimited.

Mr. JAMES HODGES, C. E., is the engineer of the La Pigéonnière operations, and the process is described as follows: A center level line is traced out, and for ten feet on each side of it the surface is cleared of vegetation, the *débris* being piled up on each side to form two banks, twenty feet apart. This arrangement is the preliminary work for a canal, and at one end of it a kind of dock is formed, for launching the apparatus. It being ascertained that the peat bog contains sufficient water to flow in behind the machine and fill the excavation, the cutting vessel is started. It consists of a boat of 80 feet length, 16 feet beam, and five feet depth, with two screws, of 11 feet diameter, in front, fitted with cutting blades and driven by an engine in the stern of the vessel. The blades cut their way through the bog; and as the water flows in as fast as the peat is taken out, the vessel moves forward, generally at the rate of about 15 feet per hour. Two men are required to clear the peat from pieces of wood, roots of trees, etc. When cut, the peat is lifted by an elevator and discharged into a hopper, and thence passes into a pulping apparatus, and flows off by a distributing trough. The two men occasionally add water to keep the pulp of a proper consistence, but no other hand labor is required. The distributing trough lies at right angles to the length of the boat, and may be lengthened to deposit the material at the required spot. The peat is left on the ground to dry, to the dept of about 9 inches, and, when consolidated, it is ready for cutting into blocks. This is done with curved knives, placed 6 inches apart and mounted on a frame, and worked by two men. In a fortnight of favorable weather the blocks are ready for stacking, which a gang of a man and three boys can perform at the rate of 4 000 blocks a day. They require to be turned and re-stacked to insure thorough dryness.

Mr. HODGES states that, in 10 hours, from 300 to 400 tons of peat can be excavated by this machine. This will yield about 50 tons of dried fuel, and will leave a canal 150 feet long, 19 feet wide, and 5½ feet deep, in the peat bed. For this quanity an average of 38 men for the day of 10 hours will be required. Fuel thus made has been burned in the locomotives of the Grand Trunk of Canada Railway, with a saving, it is said, of 45 per cent. of the expense of coal, and a rather larger economy over that of wood.

The Helical Pump.

By Mr. JOHN IMRAY.

IN this paper the author describes the helical pump patented in 1868 by Messrs. BOULTON and IMRAY, and which consists of a paddle wheel revolving between two helical shells, from each of which there is a tangential passage of area equal to that of the wheel blade. When the wheel is caused to revolve in one direction a stream of water enters by one of these tangential passages, is carried round by the wheel becoming gradually shunted across the blades, and issues by the other tangential passage. When the direction of rotation is reversed, the direction of the fluid stream is also reversed. The water in its movement through the pump forms, as it were, a liquid rope continually being wound on to the wheel on the one side and payed out from it on the other side. In the passage of the liquid through the pump there are no abrupt bends or changes of direction, but only a simple circular sweep in the path of the wheel blades. Nor are there any changes in the form or area of the liquid stream. It is, therefore, believed that the loss from fluid friction occasioned by such changes of form, area, and direction in other rotary pumps is avoided in the helical pump. This pump can be used for pumping liquid in which solid matters are suspended as in sewage, because any solid body having once entered by the inlet passage finds no impediment in its course to the outlet passage.

The pump maintains a head, without discharge, at a height twice that due to the velocity of the blades, but its efficiency is greatest when it discharges at half that height of head, that is, at the head due to the velocity. From numerous experiments the author stated that it had been found that there was a slip of about 15 per cent., or that a pump of such capacity, and working at such speed that it should discharge 100 gallons, if there were no slip, actually discharged about 85 gallons. He further observed that the work done by the pump in raising water, irrespective of the friction of the engine and pump itself, amounted to about 85 per cent. of the work done by the engine driving it, the loss of 15 per cent. being due to fluid friction. Taking into account the friction of the pump and of the engine driving it, the work actually realised was about 58 per cent. of the power applied. Many helical pumps are now at work raising considerable volumes of water various heights from 10 ft. to 40 ft.; and the author states that they were found particularly suitable for effecting circulation through surface condensers and refrigerators.—*Engineering.*

Fossil Insects.—Where the excavations for laying the water-pipes are being made near Rideau Hall, on the grounds of the Governor-General of Canada, the workmen are stated to have made an interesting geological discovery. It is a stratum of fossilized rock several feet thick, containing the most perfect and beautiful winged insects, many of them in a very perfect state of preservation.

Iron Ore Production of Missouri.

ACCURATE statistical information concerning the industries of Missouri, the "Pennsylvania of the West," has been difficult of access, owing to the many obstacles usually met with in new districts, and from the fact that some of the most important mining companies have heretofore objected to the publication of their operations.

The St. Louis *Railway Register* has compiled, from the most accurate sources at its command, the following comparative statement:

RECEIPTS OF IRON ORE AT ST. LOUIS.

Month.	1873.	1874.
January	30,330	6 135
February	31,750	6 715
March	32,685	14,365
April	54,652	23,280
May	39,280	29,825
June	34.365	21 980
July	34.515	17,140
August	35,480	15 835
September	25,345	13.220
October	15,780	8,090
November	9,590	4,615
December (estimated for 1874)	5,585	5,000
Total	349.357	106 200

Decrease in 1874, 183,157 tons.

The routes of transportation were: the St. Louis, Iron Mountain and Southern and Atlantic and Pacific Railroads; the receipts in 1873 by the St. Louis, Iron Mountain and Southern Railroad being 280,265 tons; and by the Atlantic and Pacific, 69 082 tons, from the great central mineral belt of Missouri.

The principal developments in this section are in Crawford, Dent and Pulaski Counties, the leading mines of which are the Meramec, Beaver Creek and Simmons' Mountain; but several others have been opened, ready for operations, having sufficient capacity to double the production of 1873 in this region, whenever the furnaces require it. The consumption of Missouri iron ore by the Ohio Valley furnaces and in the East is shown by the accompanying statement of the

SHIPMENTS OF IRON ORE FROM ST. LOUIS.

Month.	1873.	1874.
January	2,274	3 063
February	16,076	8,849
March	27,034	23.019
April	28,435	22,770
May	27 692	20,905
June	17.685	8.691
July	15 270	7,055
August	13.473	5.910
September	10,092	1 400
October	10,223	2,515
November	5,460	2,223
December (estimated for 1874)	3.330	2,000
Total	179 099	108,400

Decrease in 1874, 70,679 tons.

Of the shipments for 1873, 113,327 tons went by river, and 65,752 by railroad. To show the actual production in the State it will be necessary to add to the above statement of receipts at St. Louis the amount of ore consumed by the furnaces in the State, amounting in 1873 to nearly 100,000 tons.

PIG IRON.

		1873.	1874.
Receipts—	To November 1st	56,931	42,688
	To December 31st	61,088	.....
Exports—	To November 1st	53 550	33,148
	To December 31st	57,571	.....

Ferro-Manganese.

THOUGH the following article from the *American Exchange and Review* is somewhat old, the interest in ferro-manganese being greater than at any previous time, we give it in answer to numerous inquiries as to its manner of manufacture:

It is stated that the directors of the Terre-Noire iron works have for some time been occupied with experiments in the mixture of iron with manganese—the following being substantially the specification of their patent and a description of their mode of operation: If, according to the specification, filings, or turnings of iron, steel, or cast iron, even iron-sponge, roughly broken up, or any other kind of iron or steel in a similar state of division, be mixed with ores containing manganese, tungsten or titanium, or any or all of these metals united, or with quartz, the ores or quartz being finely pulverized and mixed in the proper proportions for the alloy desired, and if this mixture be regularly and thoroughly moistened with a solution of ammonica or slightly acidified water, and finally, if this mixture be firmly compressed, either by hand or other means, into an iron mold, a large amount of heat will be evolved; and, after some hours, if the mould be opened, a compact and very hard mass will be formed, which may be broken up with a hammer to the size required. These fragments maintain themselves at a red heat, and only disaggregate themselves at the melting point of cast iron. By treating them in a blast furnace, alloys of iron and manganese in any proportion, from 25 per cent. to 50 per cent. of the latter metal, may be obtained; also, in the same way, alloys of 22 per cent. of silicium, alloys of iron with tungsten or titanium, or with any or all of these metals. But these alloys can only be produced at very high temperatures, and the blast must be injected very hot and under great pressure.

In consequence of these conditions the furnace is severely tried, especially in the lower parts, and, to avoid accidents, should be constructed in the following manner: The furnace itself should be built of very hard fire clay bricks, in which alumina predominates—the lining of lime, magnesia, or pure alumina—and a crucible should be used composed of carbon, lime and manganese. This crucible is made in the following manner: A mixture of pure graphite, gas coke, carbon and tar, is put into a strong plate iron mold, which can be perfectly closed, and which is then submitted to a low red heat for several hours. By this means a compact hard mass is produced, without fissures or joints. The crucible is movable, and is merely set against the lower part of the lining of the furnace, and secured by lumps of fire clay. Arrangements are provided for by which any part of the furnace may be repaired or replaced with facility. The blast is heated to at least 350° C, and the pressure carried to 13 or 15 centimetres of mercury.

This ferro-manganese is not a new product, inasmuch as it has been produced by at least two different methods—that of PRAEGER, which is effected in a crucible, and that of HENDERSON, in which a regenerative furnace is employed. These two processes are founded on the simultaneous reduction of a mixture of pulverized ores of iron and manganese in presence of finely divided charcoal. The presence of iron in the mixture determines the complete reduction of the oxide of manganese, to which it is indispensable. It is well known how difficult it is to obtain metallic manganese in the laboratory, and how much fuel and time are consumed in obtaining the complete reduction of the oxide of manganese with charcoal alone. In consequence of the pulverulent nature of the mixture, and the poorness of the bed of fusion, which must contain an excess of charcoal, these processes can only produce small quantities of the metal per day, and at the cost of an enormous consumption of fuel.

Attempts have been made to find a process of a more practical nature, which should effect successively and more rapidly—first, the reduction of the oxide, and afterwards the fusion of the alloy. With this view a vertical apparatus was designed, something like a blast furnace, in which ores of iron and manganese are introduced, and alloys were produced containing as much as 18 per cent. of manganese; but it was found that the particular kinds of ore required for the purpose were so rare that the process could not be carried out with success.

Other means have also been resorted to; the materials have been made into bricks, and exposed in that form to the fire, but not successfully. Still, some such process is said to be much employed in Germany, the alloy produced containing, according to analysis, 30 per cent. of manganese, 35 per cent. of iron, and 5 per cent. of carbon. The Terre-Noire directors assert that, by means of the process here described, they have succeeded in producing the long sought alloy in a practical and economic manner.

Notes.

To Prevent Tools from Rusting.—Boiled linseed oil will keep polished tools from rusting if it is allowed to dry on them. Common sperm oil will prevent them from rusting for a short period. A coat of copal is frequently applied to polished tools exposed to the weather.

M. Krupp, at Essen, after many previous experiments in the same line, has turned out cast steel plates supposed to be equal to the strongest manufactured in England. As soon as the 30 centimeter cannon is ready, the solidity of the novel plates will be tested by the novel gun.

Tariff on Iron in Japan.—It appars that the term "wrought iron," used in the Japanese tariff, has been explained to the foreign representatives at Jeddo to include T-iron, angle iron, iron rods and bars, nails, plates, ferrules, hoops, and hoop iron, upon which the duty is three-tenths of a "bou" per 100 catties. All other articles in iron pay five per cent. *ad valorem*. No change made in the rates charged on pig-iron, wire, etc.

Rapid Mining.—As it is constantly stated that "time is money in mining," it will be interesting to learn what great rapidity can be attained with machine-drills and dynamite. At the St. Gothard Tunnel, where they are in solid granite, the heading was driven during the month of October 188 metres, or, including all delays and stoppages, more than 6 metres a day. It will be remembered that the advance heading is 8 ft. wide and 8 ft. high; yet in 31 days 104 fms. forward progress has been made, or over 3 fms. 2 ft. per day. To attain this average the process upon some days was really astounding.

A Japan Bronze.—A bronze which has lately been discovered to be much in use in Japan, has been found to be composed of 5 parts of tin and 10 of lead to 100 of copper. It is cast generally in thin sheets like slates, upon which beautiful designs in silver may be incrusted as follows:—The plates are covered with a varnish upon which the designs are graved with a style, the plates are then plunged into a suitably prepared bath to receive a deposit of silver upon the graved lines. When a sufficient deposit has been formed on the parts from which the varnish has been scratched, the plates are placed in a muffle furnace, in which the bronze turns black and the silver remains white and brilliant, showing up beautifully by the contrast.

To Make Imitation Gold.—Take of pure copper, 100 parts; zinc or preferably tin, 17 parts; magnesia, 6 parts; sal ammoniac, 3.6 parts; quicklime, 1.8 parts; tartar of commerce, 9 parts. The copper is first melted, then the magnesia, sal ammoniac, lime, and tartar are added, separately and by degrees, in the form of powder; the whole is now briskly stirred for about half an hour, so as to mix thoroughly; and the zinc is added in small grains, by throwing it on the surface and stirring until it is entirely fused; the crucible is then covered, and the fusion maintained for about 35 minutes. The surface is afterwards skimmed, and the alloy is ready for casting. It has a fine grain, is malleable, and takes a splendid polish. It does not corrode readily, and for many purposes is an excellent substitute for gold. When tarnished, its brilliancy can be restored by a little acidulated water.

THE ENGINEERING AND MINING JOURNAL.

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Supplements and Extra Editions of the Engineering and Mining Journal.

THIS week we have the satisfaction of giving our friends, in the form of a supplement, the valuable paper of JOHN FULTON, Esq., Engineer of the Huntington and Broad Top R.R., on washing coal for coking.

We have also in preparation a very beautiful topographical map of a large part of Mexico, showing the mining regions over an area of 150 miles in length, by 100 miles in width, lying to the south and east of the City of Mexico. This will be the finest map that has ever been published of this rich mineral country, and the only one which gives the location of the newly discovered coal field of Acatlan. A full description of the coals, which are both anthracite and bituminous, will accompany this map.

On January 2nd, we will issue a magnificent illustrated supplement, now being engraved, and will also print a large extra edition. We beg to call the attention of manufacturers and dealers in all kinds of mining machines and mine supplies, minerals and metals, to the advantages which these extra supplements and large editions of THE ENGINEERING AND MINING JOURNAL offer for bringing their goods and their business prominently before their patrons.

No other paper published in this country is received and preserved by so large a number of the purchasers of mining and furnace supplies, and of the products of our mines.

Remarks of R. W. RAYMOND, President of the American Institute of Mining Engineers, at the dinner given by the American Iron and Steel Association to Messrs. I. LOWTHIAN BELL and THOMAS WHITWELL, at Philadelphia, Dec. 10, 1874.

MR. PRESIDENT: Your kindness on calling upon me to speak on this occasion for the American Institute of Mining Engineers I shall not betray by inflicting upon this company any extended remarks. For a large number of the gentlemen before me—perhaps a majority—while connected, as I myself have the honor to be, for purposes of harmonious commercial action, with the American Iron and Steel Association, are at the same time, for purposes of scientific inquiry and technical progress, members of the American Institute of Mining Engineers. To an audience whose faces seem familiar to me, as seen so often from my official chair on occasions both earnest and festive, I surely need not speak at length concerning a subject, all of which they know, and part of which they are. Nor do our honored guests of this evening need further light on the point. They are both members of the American Institute of Mining Engineers, and are well acquainted, by study of the publications and by personal participation in the proceedings of that body, with its nature, objects and methods. In fact, gentlemen, it appears to me that the one thing we have in common with our distinguished friends is that we all are, or ought to be, members or associates of the Institute of Mining Engineers, which includes, as you are aware, not merely mining engineers in the strict sense, but metallurgists, civil and mechanical engineers, and all persons engaged in mining or metallurgical industries. In other respects, our guests of this evening might not agree with us, nor with one another. Interests and opinions may and do differ on questions of politics, finance, commerce, and political economy. But there is one thing in which we all believe—in knowledge, its progress, its diffusion, its application for the good of mankind and the benefit of the practical art with which we are connected. The men who have bestowed upon us new ideas and inventions we recognize as benefactors for all time. And those who have given us, besides results achieved, the means of achieving still greater ones, are benefactors of the highest rank. When HALLEY, with prophetic genius, devised the method of observing and utilizing the transits of Venus, which he could not possibly live to employ, he did more than all the astronomers who, day before yesterday, from the cold North to the cold South, pointed their glasses to the sky. And when LOWTHIAN BELL deduced from experiments on the Cleveland furnaces a principle by which we may measure the economy of any blast furnace, he gave us a boon surpassing in value the mere example of successful practice which these furnaces present. For he solved the mystery of the chemical reactions of the blast furnace, and elevated the art into a science, by introducing into it a standard of measurement and calculation. Mathematics has been defined by the great American mathematician as "the science which draws necessary conclusions;" and I may without violence reverse the statement and say that no art becomes scientific, and no science draws absolute conclusions, until it attains to mathematical form. If the question were asked, "What have been the three greatest steps of progress in the history of the blast furnace?" I think the reply would be, "the hot blast; the utilization of the furnace gases; and the discovery of the relation between the constitution of those gases and the economy of the furnace." I can fancy some plain and practical ironmaster of the last generation asking: what means all this talk about temperatures and equivalents, and heat-units, and, above all, the mystical ratio $\frac{CO_2}{CO}$ which is now all at once affirmed to be very important, whereas in my time folks did very well without suspecting its existence? I need not tell *you*, gentlemen, in such a presence, that these things mean *business*—that CO may stand for coin, that the pyrometer may indicate the rise and fall of profits as well as temperatures. But I have trespassed too long on your patience; and will only linger a moment more, to couple with the names of such investigators as BELL, AKERMAN, TUNNER and GRUNER, the names of inventors like BESSEMER, SIEMENS, DANKS and WHITWELL, each of whom has incarnated a discovery of science in an effective apparatus of practice. There need be no strife for laurels between the men who have wisely seen and clearly told what needed to be done, and the men that have grandly *done it*. The two functions are not seldom united in the same person; and, at all events, they are always united in the admiration and gratitude of mankind.

Mr. Bell's Departure.

ON Wednesday last, Mr. I. LOWTHIAN BELL sailed for England, bearing with him the good wishes of all who had the pleasure of meeting him during his stay in the United States. On Thursday, the 10th inst., a banquet, under the auspices of the American Iron and Steel Association, was given to Messrs. BELL and WHITWELL, at the Continental Hotel, in Philadelphia. The affair was very successful, both in the large attendance and in the interesting character of the speeches. Hon. ABRAM S. HEWITT, of this city, made the principal address, which included an eloquent tribute to the distinguished guests, and a well-considered discussion of the present and future bearings of the conditions surrounding the industry of iron. Both Mr. BELL and Mr. WHITWELL, in their replies, bore witness to the hospitality with which they had been everywhere received in this country, and to the high degree of progress, in many particulars, which they had observed. Mr. BELL frankly confessed that in some departments, particularly in Bessemer and rolling-mill practice, he thought England might find much to copy here; but, on the other hand, he did not conceal his impression that the average economy of our blast-furnace practice was inferior to what it ought to be.

Not less enthusiastic was the dinner given in honor of Mr. BELL, on Monday, at Bethlehem, Pa., by the ironmasters of the Lehigh Valley, at which the venerable DAVID THOMAS presided, and nearly, or quite, all the ironworks of the region were represented. This was Mr. BELL's farewell to the United States, and the heartfelt words which he spoke on the occasion found echo in the honest sentiments of friendship and regard entertained by all who had the pleasure of listening to him.

When he came to this country, American ironmasters were ready to receive him as one who had rendered to their profession, by persevering and unselfish labors, and by the generous communication of the results of his investigations, service of the highest value. They esteemed in him the successful ironmaster, the skillful and earnest investigator, the famous author, and the official representative of the foremost technical association of England—we mean the British Iron and Steel Institute. It is not too much to say, that as we bade him farewell, all these claims upon our admiration and respect were lost sight of in the stronger emotions of personal esteem and affection, which his brief stay among us has sufficed to awaken in all our hearts.

Mr. BELL purposes, as he has repeatedly intimated, to lay before the British Iron and Steel Institute, possibly at their next meeting, his views concerning the iron manufacture in the United States. Whatever he may say of us, we know he will speak only what he deems to be just, and he will speak it in that kindly spirit which renders criticism more welcome than compliment.

Ringwood Magnetites.

WE notice that Messrs. COOPER, HEWITT & Co. are offering for sale Ringwood magnetite at $5, delivered on the cars at Mountain View, on the Morris and Essex Railroad, from which point it can be advantageously shipped into the Lehigh Valley and to various works in New Jersey and New York.

Nearly all of the Ringwood mines were opened by ROBERT ERSKINE, Geographer and Surveyor General to the United States Army, during the revolutionary war. He died in 1780, and his tomb now stands on the Ringwood estate. It is estimated that the mines have produced already more than 500,000 tons of ore. There are more than a dozen different mines open on the property, and, of course, the quality of the ore is not the same in all of them, but it is in most cases extremely rich in metallic iron, free from sulphur and not free from phosphorus. The following analyses from the Cannon, St. George, and Miller mines indicate the nature of the ore now principally shipped :

	I.	II.	III.	IV.	V.	VI.
Magnetic iron ore	75.7	.73.3	93.7	86.2	88.6	89.5
Silica and insoluble matter	16.2	9.2	2.2	6.6	3.0	3.4
Sulphur	0.0	0.0	0.0	0.0	0.0	0.0
Phosphoric acid	.9	1.1	0.0	trace.	3.2	0.6
Metallic iron, per cent.	54.8	53.1	67.8	62.4	64.1	64.8

I, II, III, IV, Cannon ores ; V, St. George ; VI, Miller.

It is important to note that some of the Cannon ore contains no phosphorus at all, and we learn it as a fact, which will have great interest for all the proprietors of magnetic mines in New Jersey, that freedom from phosphorus characterizes apparently the ores of this mine in proportion to the depth of working. The immense mass of the Cannon outcrop, which has a breadth of 100 feet and extends northeast and southwest for about 125 feet, is worked by an open quarry, and little or no attempt is made to follow particular zones in the ore, on account of their superior quality. No doubt it will be possible to obtain from this mine a considerable quantity of ore suitable even for Bessemer manufacture ; and when the whole mining operations have been extended somewhat further in depth, it is quite likely that this will be the character of the entire ore-body. The pure Cannon ore found at the bottom of the mine gives a red streak, and is therefore largely a sesquioxide. This peculiarity is commoner among the New Jersey magnetites than is generally supposed by blast furnace proprietors, and when it occurs it is frequently attended by a superior purity of the ore, though perhaps this is not always the case. The manifest improvement in depth of the Ringwood ores should be an encouragement to mine proprietors in New Jersey, and also a hint to them to have their ore frequently analysed, lest, unknown to them, the quality and value may greatly improve.

The Need of Cheaper Iron.

IT is very gratifying to find our views endorsed, even though the recognition of their correctness comes somewhat late. Six or eight months ago, when we insisted that our iron men must abandon the policy of leaning on outside help to keep up the prices of iron, and must help themselves by reducing the cost of making iron, we stood alone and even excited much opposition. One after another, the technical papers of the country have come round to see the correctness of this advice, and we have now another waking up to the true condition of the trade and repeating our advice as follows : "The only escape from the present unpleasant condition of the trade lies in the practicability of so cheapening the cost of production as to meet not only present low prices without loss, but to meet also still lower prices, and maintain the integrity of the industry under all circumstances likely to affect its prosperity in future. This is the problem before the iron trade to-day." While there is certainly room for a reduction in the price of some of our best known iron ores, there is also room for a reduction in the price of anthracite to our furnaces in Eastern Pennsylvania, and the freight charges on ores and fuel can, and should, be considerably reduced. As many of our furnace companies mine their own ore, its cost at the mines is now, with wages $1 00 to $1 25 per day, as low as can be expected till the more general introduction of labor saving appliances, such as rock drills and dynamite in the magnetites, the substitution of machine hauling for that by wagons and carts, now in use, and the better preparation of the ore at the hematite mines.

At the furnace itself, a great economy can be effected by the adoption of such modifications as will bring the consumption of fuel down nearer to the amount actually necessary for the reduction and smelting of the ores. Some of our works, especially some of those using raw coals in the West, and those using anthracite in the East, are consuming an immense excess of fuel over this standard.

We are glad to see the attention of our iron masters directed to this question, and will shortly publish some investigations on this subject at works using raw coal. When our iron masters have made up their minds to the fact that we are not going to have any return to the high prices of a few years ago, and that they must contend with a close home competition, they will direct their attention, as indeed they are now doing, to economy in manufacture, and we have no doubt whatever will attain results that will enable us to greatly extend our markets.

A Cause of Explosions of Steam Boilers.

AN important discovery bearing on this subject was recently made at the Ougrée iron works at Liege, Belgium, as we learn from the *Moniteur Industriel Belge*. One of the lower (boiling) tubes of a new steam boiler heated by the flame from puddling furnaces recently exploded; in examining it, it was noticed that the tube for some length along one of the joints was greatly reduced in thickness and a certain pasty substance of a black or dark yellow color, and possessing highly corrosive properties was found to have caused the injury in the tube. An analysis proved this substance to be composed principally of ferrous sulphate, and it contained 11.85 per cent. of *free sulphuric acid*.

This discovery shows the necessity of cleaning the surfaces of boilers where mineral fuel is used, and especially those portions of the boiler which are least exposed to the flame or the smoke draught. This, it is supposed, may have been the cause of many of the explosions, the origin of which is now shrouded in mystery.

An Interesting Discovery in Iron Ores.

WE have a contemporary that is always finding out things that no other fellow can understand. A while ago it found an ore yielding 90 per cent. of metallic iron. More recently it discovered a place in Alabama where coal can be mined and "put in the cars" for 50 cents a ton, and in West Virginia a place where a mine can be opened to a capacity of 50,000 tons a year for $2,000. It has now added to our obligations by telling us of brown hematite ores having the following peculiar composition :

	No. 1.	No. 2.
Protoxide of iron	70.00	80.00
Water	12.00	15.00
Manganese	2.50	1.00
Silica	4.50	4.00
Alumina	1.00	....
Total	100.00 !	100.00
Yielding metallic iron	61.75	62.00

Unfortunately our contemporary has neglected to give the name of the chemist who made the analyses, or we would take pleasure in giving him a share in the credit his work deserves. These remarkable brown hematites, we are told, are found in Stewart County, Tenn., and "their reputation has been made since 1829."

We have not space to-day to do more than call the attention of our mineralogists to this discovery of brown hematites composed of protoxide of iron, instead of sesquioxide, as other ores classed under this name, and to the remarkable variation in these ores from the usual equivalents—28 and 8—for iron and oxygen, which chemists have been in the habit of adopting.

Bergrath Burkart.

AT the October meeting of the American Institute of Mining Engineers, Dr. HERMANN JOSEPH BURKART, of Bonn, Germany, was elected a foreign member. His first contribution to the proceedings of that body we published a fortnight ago. Now it is our sad duty to announce that this first paper was also his last, since, on the 7th of November, at the ripe age of nearly 77 years, he fell a victim to a painful disease, which had for years restricted, though it could not prevent, his literary industry. The technical, scientific, and statistical productions of his pen, proceeding from his chamber of weakness and disease, have done no less to maintain and extend his reputation, than the more active labors of his earlier life.

Dr. BURKART was born at Bonn in 1798, entered, in 1817, as a mining cadet, into the Prussian service, and pursued both practical and theoretical courses until the year 1822, when he passed his final examination before receiving a position in the administration of the mining department. His first labor was the geognostic and economic examination of the district of Kreuznach, Westphalia. After this, he was detailed as technical assistant to Saarbrücken, and in 1824 was advanced to other positions successively in the Prussian service. In the following year he resigned for the purpose of accepting a position as technical manager for an English company in Mexico. Three years later, he changed this position and accepted the management of another company in the same country. The extent and success of the latter enterprise may be inferred from the circumstance that this company (the Bolannos), in the six years of his management, from 1828 to the end of 1833, produced, from about 1,400,000 tons of ore, a net profit, after payment of very high government taxes, of about $4,500,000. In 1834, he returned on furlough to Germany, where he married and concluded to remain. His sojourn in Mexico gave rise to numerous interesting and valuable communications concerning the geological and mining conditions of that remarkable country. These were subsequently revised and published in 1836, in two volumes. In 1837 he was re-appointed into the Prussian service as secretary of the mining bureau at Bonn. He was subsequently advanced until, in 1858, he received the title of Privy Mining Councillor. His official activity as a member of the council was continued until, in 1867, his growing ill-health forced him to retire, on which occasion he was nominated an honorary member of the mining office, with a right to take part in its sessions, and was decorated also by the royal hand with the order of the Red Eagle.

Neither BURKART'S entry upon official duties, nor his retirement from them, interrupted his persevering literary activity. In 1838 he published, as joint author with NOEGGERATH, a pictorial work on *The Structure of the Earth's Crust*, in five plates, with explanatory text. In 1839 appeared his translation of MANTELL'S *Wonders of Geology*. Numerous contributions to scientific periodicals, principally based upon his rich collection of minerals and rocks from Mexico, bore witness for many years to his industry and enthusiasm for science. The Mexican meteorites, and many new mineral species, were described and discussed by him. After 1868, confined by personal infirmities, mainly to such labors as could be carried on in his own study, he occupied himself largely with reviews and com-

pilations concerning the mining and metallurgical industries. Few men have done so much to make known to the German public the contents of the technical and statistical literature of other lands.

Dr. BURKART was deeply interested in the progress of mining and metallurgy in the United States. Not only his essays on the mineral wealth of California and of the Pacific coast generally, the Comstock vein in Nevada and its development by means of a deep tunnel, petroleum and its production in North America, etc., etc., but also his numerous private letters to the editor of this Journal, indicated an intelligent perception of the conditions of our mining industry, a lively sympathy in our progress, and a thorough acquaintance with our history. These would have been remarkable in any foreigner; in an invalid and recluse they were marvelous.

We recall with mingled pleasure and sadness a delightful hour spent, in the summer of 1873, in the study of Dr. BURKART, with whom we had been previously acquainted through correspondence only. The cordial kindness and simplicity with which, on that occasion, he received us, were such as to make our parting like the parting of old friends rather than of new acquaintances; and the recollection now adds to our regret at the termination of an honorable and useful career the pangs of a personal loss.

NEW PUBLICATIONS.

Wolf's Wild Animals.

MESSRS. HARPER BROTHERS have brought out, under this title, a book that will be welcomed by all who can appreciate the beautiful. The twenty engravings which adorn its pages are from designs by the famous animal painter, JOSEPH WOLF, and are very gems, both in conception and execution. The popularity that it is sure to attain will make the influence of this book, as an art instructor, widely felt, for it is by such publications as this, treating subjects of great interest in a manner at once popular and artistical, that the knowledge of art and the love of the beautiful is disseminated among a people and the education of a nation is raised to a higher level.

The excellent taste with which this work is published, adds still more to its attractiveness, and, if we mistake not, it will become an exceedingly popular holiday present.

Wiley's American Iron Trade Manual of the Leading Iron Industries of the United States, with a Description of the Iron Ore Regions, Blast Furnaces, Rolling Mills, Bessemer Steel Works, Crucible Steel Works, Steam Engine and Machine Works, Iron Bridge Works, Iron Ship Yards, Pipe and Tube Works, and Stove Foundries, of the Country; giving their Location and Capacity of Product. Compiled and Edited by THOMAS DUNLAP. Published by JOHN WILEY & SON. New York. 1874.

THE above title, which we have copied in full, tells the scope and bearing of this useful book. A very full index makes the work convenient for reference. We will not attempt to review the work, which, even though its statistics be not all correct—and we notice not a few inaccuracies—is yet exceedingly useful to every business man in the country. We will confine ourselves to making, from time to time, extracts from its pages. It is particularly valuable as a full directory of the iron trades—and there is no pretention to originality in its statistics.

THE successive volumes of the American Cyclopædia, under the skillful editorship of Messrs. RIPLEY and DANA, show rather an increase than a diminution in the variety, interest, and value of their contents. The seventh, eighth and ninth volumes are among the most valuable which have appeared. In the seventh volume, we find, among the new articles contributed on subjects of special interest to this journal, an excellent summary of the phenomena of geysers, by JOHN D. CHAMPLIN, Jr. Capt. C. E. DUTTON, of the Ordnance Corps of the United States Army, a name which we are glad to find among the writers of the Cyclopædia, is represented by a series of remarkably clear and thorough articles under the titles *Fowling Piece, Gun Cotton, Gunnery, and Gunpowder.* Another name which indicates to us the right man in the right place is that of Prof. THOMAS M. DROWN, of Lafayette College, who appears in the ninth volume as the author of the article on *Iron*, a marvelous example of skillful condensation and arrangement. These qualities are still more strikingly shown in the article *Iron Manufacture*, in the preparation of which the senior editor of this journal was associated with Professor DROWN. The index of contributors places this article wholly under Mr. RAYMOND'S name—an unintentional injustice to his distinguished colleague, who deserves the credit of the admirable arrangement and the simple but scientific treatment, which render it, in our opinion, the most complete and satisfactory essay on the subject which can be found, within the same space, in English literature. Mr. RAYMOND is responsible for articles on *Explosives, Gold Mining*, and *Iron Ores*. In military engineering we note the appearance among the contributors of Prof. JUNIUS B. WHEELER, the able successor at West Point of the lamented MAHAN. Prof. WHEELER furnishes an article on *Fortifications*. Prof. STERRY HUNT contributes to these as to former volumes; and when we say that he is the author of the articles on *Fossil Footprints, Geology, Gold*, and *Granite*, we need not add that these subjects are ably treated. Prof. MAYER, of the Stevens Institute, has given, in small space, a review of the subject of *Harmony*, to which his own discoveries have contributed so much in establishing what may be called the mathematical basis of the science of music. Our friend, Prof. YOUMANS, is represented by the article on *Evolution*, which has been so violently, and it seems to us unjustly, attacked by religious journals.

But the enumeration of contributions of entirely new articles to the present edition of the Cyclopædia would by no means do justice to the merits of the work. The thorough revision which has been given to every page by the editorial staff is still more important; and the introduction of well executed maps and engravings confers a value upon the Cyclopædia far greater than is represented by the striking improvement of mechanical appearance which this feature effects. As the publication progresses we are more and more pleased with its plan and execution.

Chemical and Geological Essays, by THOMAS STERRY HUNT, L. L. D. Boston, JAMES R. OSGOOD & Co., 1875.

The appearance of this volume will be welcomed by two distinct classes of readers. On the one hand, those chemists and geologists who, whether they concur in the views of Prof. HUNT or not, cordially recognize his great ability and industry, and the importance and suggestiveness of his numerous investigations, will rejoice to possess, within the compass of a single volume, the statement of researches and conclusions which they need to consult so frequently, and which have been hitherto scattered in scientific periodicals, reports and monographs. HUNT'S contributions to chemical geology and lithology cannot be overlooked by any one who professes to follow the progress of these sciences. On the other hand, the general reader, desirous of some insight into the advanced modern theories which text-books on geology have not yet absorbed and reflected, will find in this book an excellent statement and defence of them. While many of the essays are addressed primarily to experts, familiar with the facts, methods and nomenclature of science, there are others, which appeal as well to the intelligent appreciation of all educated men. Under this head, we may mention with particular praise the essay on *The Chemistry of the Primeval Earth*, and that on *The Origin of Metalliferous Deposits.* Such discussions as that on *The Geognosy of the Appalachians*, or that on *The Cambrian and Silurian in North America*, are fine specimens of the forcible style, and the acquaintance with scientific literature, which characterize the author. We do not purpose to discuss the points at issue between Prof. HUNT and other geologists, with respect to the relations of the older crystalline rocks, and the theories of metamorphosis. The debate is one of difficulty equal to its importance; and we are glad that one side of the case is collected and arranged so as to offer a complete argument. In fact, the papers in the book before us, covering a range of topics which embraces the chemistry of the atmosphere, the sea and subterranean waters, the origin of limestone, dolomite, gypsum, petroleum, metalliferous ores, mountains, crystalline rocks and veinstones, volcanoes and volcanic products, constitute, as Prof. HUNT remarks in his preface, a complete scheme of chemical and physical geology. Incidentally, this collection and republication of them vindicates for their author the priority of announcement with regard to some important theories, which are now gaining wide acceptance. Not all of Prof. HUNT'S views, we venture to think, will be universally adopted; but there can be no doubt that many of them, doubted or denied at first, have won their way to recognition.

The Life of Admiral Foot. By JAMES MASON HOPPIN. Published by HARPER & BROS.

AS AN Engineer, Admiral FOOT must always hold a high position, for the difficulties he so successfully overcame, in his gunboat campaign on the Western rivers, were no less achievements in engineering than is the building of a bridge or the designing of an iron-clad. The book is a pleasant and wholesome one, for it agreeably records not only the acts of an accomplished officer and engineer, but of one whose life is an example of honor and uprightness that will long be quoted for the imitation of his successors in our Navy.

The care and taste that characterize the publications of the HARPERS is seen in every page of this book, which, we have no doubt, will obtain, as it deserves, a wide circulation.

GEOLOGICAL SURVEY OF INDIANA, 1873.

Fifth Annual Report.

By Prof. E. T. COX, STATE GEOLOGIST.

Assisted by Profs. JOHN COLLET, W. W. BORDEN, and Dr. G. M. LEVETTE.

WE have postponed from week to week, till the weeks have run into months, our notice of the last report of Prof. COX, hoping that we would find more time and space to devote to so pleasant a task. We have not yet found either, but will shortly make both, and quote somewhat extensively from this book.

Prof. Cox devotes a large part of his report to the iron question; it opens with two excellent papers by HUGH HARTMAN, C. E., one on the Iron and Steel Industries of Rhenish Prussia, and one on Spiegeleisen manufacturing, as represented at the Vienna Exposition.

Prof. Cox gives his interesting experiments with coking coals under pressure, the same as described in a paper read before the American Institute of Mining Engineers, and published in this Journal some months ago.

Prof. Cox has unbounded admiration for the natural resources of Indiana, and believes that State is destined to become one of the principal iron manufacturing districts of the Union. Among the most important sources of ore supply noticed are the beds of black and clay band ores of the coal measures. These ores contain from 26 to 31 per cent. of metallic iron, and some of them from 5 to 7 per cent. metallic manganese. Roasted, the knob ores contain:

From 39.81 to 47.48 iron.
" 7.72 to 10.44 manganese.
" 11.00 to 14.02 silica,

a composition that Prof. Cox considers suitable for the manufacture of spiegel.

PROF. COX ON BLOCK COAL AS A BLAST FURNACE FUEL.

Prof. Cox has devoted much attention to the subject of block coal as a blast

furnace fuel, and the influence its use should have on the form of the furnace. The following extracts, giving his views, will be of interest.

"From the fact that raw coal is changed to coke before it is burned, the effect produced by the two fuels, coke and raw coal, are the same in the zone of fusion, and it is only in the upper part of the furnace we must look for dissimilar effects. Here the raw coal is gradually heated, and the hydrogen and hydrocarbons, which form about forty parts of its substance, are distilled off, and the gaseous contents of the shaft are consequently about thirty seven per cent. greater than when coke is the fuel; it follows, therefore, that if the size of the throat and gas flues are properly adjusted for coke, they must be made at least one-third larger for raw coal. If this point is not attended to the furnace must lose heat, through want of proper combustion, run irregular, and consume vastly more fuel per ton of pig iron made.

"According to Mr. BELL, 'raw coal in the blast furnace requires the extra heat produced by fifteen pounds of coke for every 100 lb. of coal, to expel the volatile matter, or, in other words, to coke it, and its reducing powers are diminished, consequently, in that proportion.'

"Mr. BELL arrives at this conclusion by ascertaining that fifteen pounds of coke are burned under the retorts, at the gas works, for expelling the gas from 100 lb. of coal, and he estimates the calorics of coal and coke to be about the same. A similar showing is made, if we reason from the process of making coke in ovens; here the heat necessary for distillation is derived from the expelled gas, and of that one-third only is required for the operation, and the other two-thirds are wasted for want of means to utilize it.

"Under the most favorable management at Cleveland, in the North of England, 22½ cwt. of coke will smelt one ton of pig iron from Cleveland iron stone. This ore is a lean carbonate of iron, very similar in composition to the Clarke County, Ind., ore. Twenty-two and five-tenths hundred-weight, or 2520 lb. of coke, will correspond to 3360 lb. of block coal, and I have no doubt but that when we have discovered the proper form of furnace, and the best mode of preparing the stock at our command, less than two tons of block coal will be required to make a ton of pig iron.

"The loss of heat by absorption, when raw coal is used in the blast furnace, is more than compensated for by the highly deoxidizing action of the hydrogen and hydrocarbons in which the ore is so completely bathed. The amount of oxygen absorbed from the ore by carbonic oxide, when the fuel is coke, reaches, under favorable conditions, about 30 per cent. of the entire oxygen which it contains.

"Now, there is no reason why this reducing action of carbonic oxide should not proceed to completion if those aids which facilitate the reduction are present in sufficient quantity.

"It has been proven by investigation that moisture must be present to promote this favorable action of carbonic oxide and, indeed, it is mentioned by some that the process of deoxidation cannot take place in the furnace without it. Raw coal supplies this essential constituent, (HO.) together with hydrogen in far greater abundance than coke; and since hydrogen is a much better deoxidizer than carbonic oxide and the hydrocarbons themselves being almost as good absorbents for oxygen as the latter gas, I have every reason to believe that, when used under the most favorable conditions, we will obtain as large yields of iron with Indiana black coal fuel as can be obtained from the same ores with coke, and the quality of the iron will be superior to that made with the latter fuel.

"I am satisfied that most, if not all, of the difficulties experienced by the cooling and irregular working of the raw coal furnaces in this State come from a want of a sufficient sized outlet at the throat for the waste gases, for it must be borne in mind that the heat of the furnace, within certain bounds, depends upon a good upward draught."

COAL TRADE REVIEW.

Import Duty on Coal.

Anthracite free. *Bituminous*, per ton of 28 bushels, 80 lb. to the bushel, 75c., gold.

All *slack*, or *culm*, such as will pass through a half-inch screen, per ton of 28 bushels, 80 lb. per bushel, 40c., gold.

Not otherwise provided for, per ton, 40c. gold.

This is the only report published that gives full and accurate returns of the production of our Anthracite mines.

NEW YORK, Dec. 18, 1874.

The Production of Anthracite Coal for the week ending Dec. 12, 1874, was as follows:

Tons of 2240 lb.	WEEK. Tons.	YEAR* Tons.
Wyoming Region.		
Delaware and Hudson Canal Co	52,032	2,274,797
Delaware, Lackawanna and Western R.R	51,881	2,392,722
Pennsylvania Coal Co	23,579	1,273,153
Lehigh Valley R.R.	18,980	905,341
Pennsylvania and New York R.R	....	57,596
Central Railroad of New Jersey	33,719	1,449,896
Pennsylvania Canal	....	321,374
Sold at the mines by L. & W. C. Co	863	22,840
	181,054	8,697,719
Lehigh Region.		
Lehigh Valley R.R	58,506	3,059,874
Central Railroad of New Jersey	22,725	1,141,768
Danville, Hazleton & W. B.R.R.,	970	39,558
	82,201	4,241,200
Schuylkill Region.		
Philadelphia and Reading R.R	82,129	5,171,710
Shamokin and Lykens Valley	9,516	884,827
	91,645	6,056,537
Sullivan Region.		
Sullivan and Erie R.R	422	32,807
Total of all the regions	355,322	19,028,263

* Year beginning Jan. 1.

The following table does not give the entire production of our bituminous mines, but it is by far the fullest report published.

The Production of Bituminous Coal for the week ending Dec. 12, was as follows:

Tons of 2000 lb., except where otherwise designated.

	Week. Tons.	Year. Tons.
Cumberland Region, Md.		
Tons of 2240 lb	23,874	2,269,793
Barclay Region, Pa.		
Barclay R.R. tons of 2240 lb	6,277	293,446
Broad Top Region, Pa.		
Huntingdon & Broad Top R.R	3,265	215,876
Clearfield, Region, Pa		
Snow Shoe	1,623	58,355
Tyrone and Clearfield	14,227	601,220
Allegheny Region, Pa.		
Pennsylvania R.R	3,923	196,738
Pittsburgh Region, Pa.		
West Penn. R.R	2,418	185,706
Southwest Penn. R.R	100	7 421
Penn. and Westmoreland gas coal, Pa. R.R.	19,646	851,463
Pennsylvania R.R	7,199	426,425
Kanawha Region, W. Va. to Dec. 5.		
Chesapeake and Ohio R.R	2,657	129,235
Shipments from *Block House Region, N. S.*, to Nov. 7.		
Consigned to the Provinces, tons 2240 lb	570	14 315
" " " United States " " "	404	15,486
" " Cuba " " "	520	1,091
Shipments from *Pictou Region, N. S.*, to Dec. 5.		
Consigned to the United States tons 2240 lb.	....	49,186
" " " West Indies " " "	....	16,388
" " Canada " " "	....	98,017
" " Other provinces " " "	2,163	72,210
" " South America " " "	....	7,175

The Production of Coke for the week ending Dec. 5.

Tons of 2000 lb.

	Tons.	Year. Tons.
Tyrone and Clearfield	13	758
Alleghany Region	....	118
West Penn. R.R., " " " " "	359	42,036
Southwest Penn. R.R " " " " "	8,736	400,349
Gas Coal, Penn. R.R. " " " " "	950	38,460
Pittsburgh Coal, Penn. R.R. " " "	1,452	63,037

Production of Bituminous Coal. 1874.

Tons of 2000 lb.	10 mos.	Nov.	11 mos.
Blossburgh Region	717,418	52,336	769,754
Barclay Region	410,300	42,241	452,541
Broad-Top Region	190,466	18,134	208,600
Cumberland Region	2,268,010	203,662	2,471,672
Clearfield Region	596 911	46,814	643,725
Alleghany Region	180,445	12,370	192,815
Pittsburgh Region.			
West Penn. RR	171,230	12,058	183,288
Southwest Penn. RR	6,933	388	7,321
Gas Coal, Penn. RR	770,794	61,023	831,817
Pittsburgh Coal, Penn. RR	400,139	19,087	419,226
Saw Mill Run RR	68,957	..	..
Cleveland and Pittsburgh RR	250,856	22,349	273,205
Pittsburgh, Cincinnati and St. Louis RR	496,414	57,408	553,902
Erie and Pittsburgh RR	243,197	17,755	260,972
Pittsburgh, Fort Wayne and Chicago RR	170,772	11,638	182,410
Castle Shannon RR	92,799	12,882	105,661
A. Y. & P. R.R	293	614	907
Pittsburgh and Connellsville RR	296,105	..	..
Monongahela Nav. Co	1,848,656	..	..
Keeling & Co	140,014	..	..
Wettengal & Gormley	9,585	..	..
J. W. Carlin & Co	3,817	..	..
St. Louis Region.			
Tenn. Coal & R.R. Co	62,778	..	..
St. L. A. & T. H. R. R. Belleville Branch	112,799	..	..
B. & S. I. R.R	63,940	..	..
Illinois and St. Louis	154,770	16,202	170,972
Indiana North and South RR	5,851	..	..
Evansville & Crawfordsville RR	13,155	..	..
Ohio & Mississippi RR	105,314	..	..
Kanawha Region.			
Chesapeake and Ohio RR	116,912	10,665	127,577
Warrior Region, Ala.			
South and North Alabama RR	23,365	..	..
Cahaba Region, Ala.			
South and North Alabama RR	3,085	..	..
S. R. & D. R.R	12,221	1,118	13,339
Chicago B. & Q R.R	224,289	..	..
B. & M. R. R.R	54,754	..	..
Union Pacific R.R. Co.'s mines	131,327	..	..
" " " other mines	81,174	..	..
Summit County R.R	17,412	..	..
Keokuk & Des Moines R. R	..	3,876	..
	10,517,257		

The production of Anthracite for the week ending Dec. 12th was as follows: Wyoming Region, 181,054 tons, being 2,583 tons less than the preceding week. In the Lehigh region, 82,201 tons, or 15,064 tons more than the week before, and in the Schuylkill region, 91,645 tons, being 7,556 tons less than the preceding week.

The total production of Anthracite from all the regions was for the week 355,322 tons, as against 350,303 tons the preceding week, (or an increase of 5,019 tons. From January 1st to Dec. 5th, there were produced 19,028,263 tons, as against 18,782,583 tons for the same period last year. The figures of last year's production are taken from the Pottsville *Miners' Journal.*

The receipts at Port Richmond were 22,000 tons; shipments, 31,500 tons; and balance on hand 123,500 tons.

Returns from Greenwich, Philadelphia.

	Bituminous.	Gas Coals.
Receipts	4,649	1,055
Shipments	8,783	1,151
On hand	2,072	760

The receipts of coal by the Michigan Southern RR. at Buffalo for the week were 5,269 tons. The shipments by Lake, 134 tons.

The exports of coal from Baltimore this year amount to 66,819 tons, as compared with 64,851 tons in 1873. The exports for the week amounted to 1,000 tons.

The production of Cumberland coal from January 1 to Dec. 12, inclusive, was 2,269,793 tons of 2240 lb., against 2,513,177 tons to the corresponding date in 1873. The production for the week was 23,874 tons, as compared with 38,089 tons for the corresponding week in 1873. This is a total decrease for the week of 14,215 tons as compared with 1873, and for the year, thus far, of 243,384 gross tons.

	week.	year 1874.	year 1873.
The receipts of coal at Coal Port (Trenton)	2,619	267,059	322,080
" " " South Amboy	12,413	600,939	441,918
Shipments at Coal Port (Trenton)	3,332	265,910	327,465
" South Amboy	9,291	596,842	443,869

The Anthracite coal trade is without material change. Some state that prices are not quite so irregular, while others say they are as they have been for some weeks past. From several sources we learn that there is a better demand from certain manufacturers. This gives some encouragement, and if we could include the iron manufacturers, we might say that a permanent reaction had actually taken place.

In Cumberland, Nova Scotia, and gas coals, there is nothing of importance to note. The cargo of Silkstone (English) coal, which has been on the market for some time, after seeking a purchaser at a very low figure without meeting one, is being lightered. The cargo of Newcastle coal reported last week as due here, has arrived, and it is said was sold at a private price.

Advices from Havana, dated 5th inst., report the importations at that port from January 1st, to December 3d, as amounting to 154,441 tons, of which 69,545 tons were from America, and 84,896 tons from Europe. The same advices state that 4000 tons of Cumberland have been sold, to arrive, at $6 50, gold, delivered. We suppose that the 200 tons reported by us November 28, was a part of this order.

We are in receipt of a telegram from H. S. DRINKER, Engineer on the Easton and Amboy R.R., saying: "Tunnel headings met Wednesday, and opened yesterday." As this is a work of much interest to consumers and producers of coal, we will endeavor to give a more full account next week, as to when it will probably be completed, etc.

We are in receipt of a comparative statement of the shipments of anthracite coal to TideWater for the years 1873 and 1874, compiled by R. G. MOULTON, Secretary of the Anthracite Coal Committee.

From a lack of space we are unable this week to give more than the aggregate shipments for 1874, but will give the statement in full in our next. The receipts at Tidewater from February to November, inclusive of both months, during 1874, were 8,248,928 tons as compared with 9,178,427 tons during the corresponding period of 1873, or a decrease of 929,499 tons. The originally allotted quota for 1874 were 10,000,000 tons, and the amended quota 8,508,250 tons. To make a complete analysis of the report, it must be carefully studied, and in our next we will lay before our readers some of the interesting lessons it teaches.

A correspondent from Wilkes-Barre says that the mines in that district are working on three-quarter time excepting the Empire shaft of the Lehigh and Wilkes-Barre Coal Company, which has been stopped and the Jersey Colliery of the Delaware, Lackawanna and Western Railroad Company.

"Dead work," such as gangways and most narrow work, and the sinking of shafts, has been suspended since the first of the month by the Lehigh and Wilkes-Barre Coal Company.

It is expected that the underground connection between the Prospect and Oakwood shafts of the Luzerne Coal and Iron Company will be made in January.

The representatives of the combined companies met in this city yesterday, the 17th Dec., and adjourned without any definite action. The object of the meeting was to discuss the labor question. At the present time, higher wages are being paid in the Lehigh Region than elsewhere, and it was proposed to make a general equal zing reduction, which was to fall lightly upon some of the regions and most heavily upon the Lehigh. This, Mr. PARDEE thought, would result in a continuation of work in the Wyoming Region, and a suspension in the Lehigh, to which he was opposed. The matter is being discussed by the Lehigh Coal Board to-day, at Mauch Chunk, but we shall be unable to procure the particulars before going to press. Upon the result of this meeting the movements of the general board will be, to a great extent, based.

The Morris Canal entirely closed on the 15th inst., the ice forming three inches in thickness. A large number of coal boats moving toward tide water are completely frozen in.

Wholesale Prices of Anthracite Coal for Dec. f.o.b. at the Tide Water Shipping Ports per ton of 2240 lb.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
†Lackawanna and Scranton at Elizabethport & Hoboken	5 55	5 65	5 75	5 90	6 40	5 35
*Pittston at Weehawken	4 75	4 75	4 85	4 95	5 35	4 50
*Wilkesbarre at Port Johnston	5 55	5 65	5 75	5 90	6 40	5 35
Plymouth, R. A	....	....	5 75	5 90	6 40	5 35
Susque. Coal Co. at Amboy W.A.	....	....	5 75	5 90	6 50	5 35
Kingston at Hoboken	5 55	5 65	5 75	5 90	6 50	5 35
*Lehigh Coals.	5 55	5 65	5 75	5 90	6 40	5 35
Old Company at Port Johnston	6 50	....	6 45	6 45	6 60	5 65
Old Company's Room Run "	6 00	....	6 00	6 00	6 35	5 35
Sugar Loaf at "	6 00	....	6 45	6 45	6 60	5 65
Lehigh Coal Exchange "	6 35	....	6 30	6 30	6 45	5 50
Honey Brook at Elizabethport	6 35	....	6 30	6 30	6 45	5 50
Spring Mt. C. Co. at Hoboken	6 35	....	6 30	6 30	6 45	5 50
Beaver Meadow at South Amboy	6 35	....	6 30	6 30	6 45	5 50
Schuylkill Coals at Port Richmond.						
Schuylkill white ash	5 05	5 15	5 25	5 40	5 90	4 45
Schuylkill red ash	....	....	5 40	5 50	5 95	4 55
Shamokin white and red ash	....	....	....	5 40	5 90	4 45
N. Franklin	....	....	5 85	5 85	5 90	4 45
Lorberry	....	....	....	6 20	6 20	4 80
Lykens Valley	....	....	....	6 85	6 85	5 40

* Small or Pea coal is quoted by these Companies at $1 35 per ton less than Chestnut.

† f.o b. in New York Harbor.

Pittston coal is delivered to carts in New York or Brooklyn at an additional charge of 40 cents per ton to the above quotations.

Freight from Hoboken and Weehawken to New York..... Per ton. 40c.
" " Elizabethport & Port Johnston to New York. 40c.
" " South Amboy to New York..... 45c.
" " Port Richmond, "Phila." to N. Y. alongside 95c.
" " Rondout to New York by boat or barges of the D. & H. Canal Co. "delivered"..... 50 c.

Wholesale Prices of Bituminous Coal.

Domestic Gas Coals.

Per ton of 2240 lb.	Shipping Ports.	Alongside in New York.
Westmoreland and Penn, at Greenwich, Philadelphia	$6 25	$7 65
" " at S. Amboy	7 00	..
Red Bank Cannel Pa., at Phil	8 50	8 50
" " at S. Amboy	8 00	....
" Orrel, " "	7 00	7 65
" " at Philadelphia	6 25	....
Youghiogheny, Waverly Co, at Baltimore	6 00	7 65
Despard, West Va., "	5 50	7 40
Murphy Run, W. Va. at Baltimore	5 50	7 40
Fairmount, W. Va "	5 60	7 40
Newburgh Orrel, Md. "	5 60	7 40
Cannelton Cannel, W. Va., at Richmond.	5 50	7 40
" Splint, " " "	11 00	12 60
Peytona Cannel, " " "	5 25	7 50
Sterling " Ohio	....	12 50
Straitsville, " At Sandusky, O	3 65	12 00

Foreign Gas Coals.

	Sterling.	Am. cur'cy.
Newcastle, at Newcastle-on-Tyne	12/@13/6	7 00@ 8 00
Liverpool House Orrel, at Liverpool	29/	13 00
Ince Hall Cannel "	52/	18 00
" Gas Cannel "	40/	15 00
Scotch Gas Cannel, at Glasgow, nominal.	28/	9 50
	Gold.	
Block House, at Cow Bay, N.S	2 25	6 50
Caledonia, at Port Caledonia	1 87½	5 70
Glace Bay, at Glace Bay	2 00	5 50
Lingan, at Lingan Bay	2 25	6 50
Sydney, International and Reserve mines, at Sydney	2 25	5 75
Pictou, Albion and Vale mines, at Pictou	2 50	6 50

Steam and House Coals.

Broad Top, at the mine, $1 25; at Port Richmond, Phil	4 75@5 00	6 00@6 25
Cumberland, at Georgetown and Alexandria, Va	4 30@4 40	5 75@6 00
Cumberland at Baltimore*	4 60@4 75	6 25@6 50
Clearfield, " Derby," "Kitanning" and "Sterling," at the mines, $1 25; at Greenwich, Phil	4 75@5 00	6 25
James River, carbonite, at Richmond, Va	6 75	9 00
" bituminous, "	4 00	6 25
*Schooner freights from Baltimore to New York are		$1 25
Barge " " " " "		1 70

Retail Prices in New York.

Anthracite.

Per 2000 lb.	Grate and Egg.	Stove.	Chestnut.
Pittston coal, in yard	$6 00	$6 20	$5 40
Lackawanna Coal delivered	7 60	7 85	7 10
Wilkes-Barre, delivered	7 60	7 85	7 10
Lehigh & Locust Mountain, del'd	8 00	8 00	7 50
Schuylkill Red Ash del'd	8 25		

The cost of delivering Pittston coal ranges from 40 cents to $1 per ton, according to distance from the yard.

Bituminous.

Liverpool House Orrel, delivered, per ton of 2000 lb	$23 00
Liverpool House Cannel " " "	25 00
American Cannel " " "	16 00
American Orrel " " "	16 00
Straitsville Cannel " " "	16 00
Carbonite " " "	16 00
Cumberland " " "	12 00
" " "	9 00

Coal Trade of Philadelphia.

PHILADELPHIA, Dec. 17, 1874.

Practically the Combination here is at an end. After maintaining prices during the year, and enforcing advance upon advance in the face of a decline in everything else, a race is taking place amongst some of the producers to sell below their published prices as soon as they have filled up the dealers and consumers. Although the companies exact the circular prices from the dealers, they come in for a decline in another shape, by lowering retail prices at some of their yards. Dealers cannot understand why rates cannot be maintained as well now as previously, and attribute the present decline to an organized and systematic design to drive them out of business. Appearances strongly warrant their suspicions.

Meetings continue to take place about next year's programme and particularly the wages for 1875; but it is believed that no concerted action has yet been decided upon on that important point. Freights remain low ($1.60 to Boston), and shipments very light.

Bituminous Coal, Wholesale.

Penn. and Westmoreland (Gas), f.o.b., Greenwich..... 6 25
Broad Top, (according to destination) f.o.b., Port Richmond..... 4 75@5 00
Clearfield f.o.b. at Greenwich, according to destination..... 4 75@5 00

Bituminous, Retail.

60 in yard, per 2240 lb., cartage added.

Anthracite, Retail.

Egg, per 2240 lb., $6 20; Stove, $6 25; Chestnut, $5 10; delivery costs, 75 cents extra.

Baltimore, Md. Dec. 16, 1874.

Reported by our Special Correspondent.

The last tow of barges left here yesterday, P. M, thus closing our season for canal shipments.

Freights by vessels, $1.35 to $1.40 to New York; $1.50 to $1.65 to Sound Ports; and $1.65 to $1.75 to Boston. Few colliers here and but little coal going forward.

WHOLESALE PRICES PER 2240 lb.

ANTHRACITE.

Wilkes-Barre, "Lee," or "Diamond,"	By cargoes.	In cars.
Lump, steamboat	$5 15	$5 60
Broken	5 50	5 73
Egg	5 87	6 15
Stove	6 07	6 35
Pittston and Plymouth.		
Lump and steamboat	....	5 50
Broken	....	5 70
Egg	....	6 05
Stove	....	6 25
"Boston," freeburning white ash	....	5 50
Egg	5 87	5 70
Stove	6 07	6 05
Shamokin, (red or white ash)	....	6 35
Egg	....	5 70
Stove	....	6 05
Lykens Valley, red ash, egg and stove	5 82	6 15
From wharf or yard. wholesale, 50@75c. additional.	5 92	6 55
By retail, all kinds and sizes, per 2,240 lb, $7@8 25.	6 02	

BITUMINOUS.

George's Creek and Cumberland f. o. b. at Locust Point for cargoes	4 60	4 75
West Va. Gas Coal f. o. b. at Locust Point	5 50	....
Kanawha Cannel, coarse	13 00	....
Tyrone	7 25	....
Ritchie Mineral of West Virginia	1 00	....

Boston. Dec. 16, 1874.

Reported by our special correspondent.

CARGO PRICES TO TRADE.

Lingan coal	$ 5 75	Westmoreland, and Penn.	7 75
Caledonia	5 00	Waverly Co, Youghiogh'y	7 75
Pictou	6 15	Cannelton Cannel	13 50
Block House	5 60	Cumberland	7 50
Red Bank Cannel	10 00	Anthracite	6 10
Glace Bay	5 00	" Retail	7 25
Sydney	7 00		8 00

Buffalo, N. Y. Dec. 16, 1874.

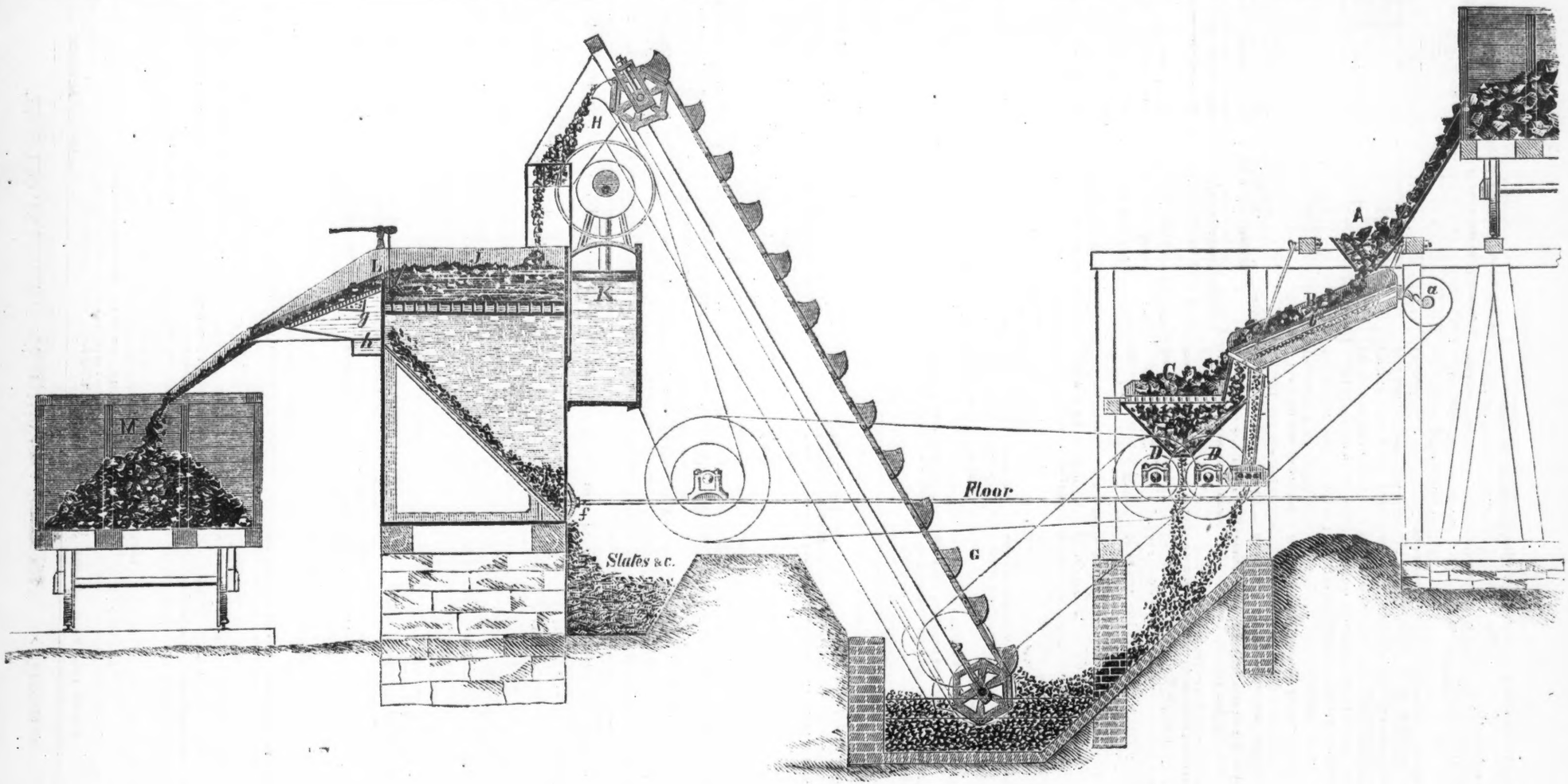
Reported by our Special Correspondent.

We are now receiving a very superior block coal, mined near Sharon, Pa., by Messrs. CURTIS & BOYCE, and called Brookfield. Please quote at $5 00 per ton, same as Briar Hill. We think the trade has improved somewhat since December 1, 1874.

AGGREGATE SHIPMENTS OF ANTHRACITE COAL TO TIDEWATER BY THE MEMBERS OF THE COAL COMBINATION DURING THE SEASON OF 1874.

Companies.	Originally Allotted Quota.	Amended Quota.	Percentage of each Company to whole Quota. Original.	Percentage of each Company to whole Quota. Amended.	Shipments to November 30.	Percentage of Shipments of each Co. to its Amended Quota.	Percentage of each Co. to whole shipments.	Amount shipped less than Amended Quota.	Amount shipped over Amended Quota.	Percentage of Deficiency Amended Quota.	Percentage of Deficiency of each Co. to total Deficiency
Philadelphia and Reading R. R. Co	2,585,000	2,182,000	25 85	25 64	1,949,716 15	89 34	23 64	232,283 05		10 66	89 57
Delaware and Hudson Canal Co	1 837,000	1,540,250	18 37	18 10	1,438,547 18	93 39	17 44	101,702 02		06 61	39 22
Lehigh Valley R. R. Co	1,598,000	1,540,250	15 98	16 13	1,371,335 18	89 00	16 63	664 02		00 05	00 26
Lehigh and Wilkes-Barre Coal & Iron Co	1,615 000	1,372,000	16 15	16 13	1,383 221 00	100 78	16 78		10,721 00	+00 78	+04 13
Delaware, Lackawanna & Western R. R. Co	1,380 009	1,372,500	13 80	14 05	1,096,319 00	91 74	13 29	163 287 19		08 26	+ 38 05
Pennsylvania Coal Co	985 000	1,195,000	9 85	9 95	1,009,787 19	119 29	12 22		174,008 19	+19 29	+62 97
Total	10,000,000	8,508,250	100.00	100.00	8,248 928 10	96.95	100.00	433,330 09		03.05	100 00

SUPPLEMENT
TO THE
ENGINEERING AND MINING JOURNAL.
DECEMBER 19, 1874.



KEMBLE COAL AND IRON COMPANY.

COAL WASHING APPARATUS.

MADE AT THE WEST POINT FOUNDRY, N. Y.

BROAD TOP COAL REGION. 1874.

Coal Washing *

By JOHN FULTON, M. E., of Saxton, Pa.

THE age we live in is greatly distinguished by progress in almost every branch of human industry.

This progress, in mining, in iron-making and working, has been so accelerated in the past quarter of a century, as to confer peculiar prominence on these allied industries.

The increase in the production of iron has been accompanied by a growing demand for an improved quality, and more especially, at the present time, in the manufacture of Bessemer steel, which is rapidly becoming an important branch of industry. This has led the makers of pig iron to a careful investigation of the composition of the materials from which their metal is produced, the inquiry being greatly assisted by a cordial alliance of science and practice. Formerly, chemical science was held in abeyance, or admitted in a hesitating experimental way; but now it is received as a valuable auxiliary, and its decisions are accepted as final and conclusive. It is called on to assist the iron maker in determining the quality of his stock, and to detect the presence of injurious elements in his fuel, ores, flux or iron.

The design of this paper is to submit the method now in use at the furnaces of the Kemble Coal and Iron Company in the Broad Top Coal and Iron Region, for removing, by a process of crushing and washing, slate and other impurities from coal designed, when coked, for furnace fuel.

It is not contemplated to claim very advanced progress in this work, believing that it is susceptible of improvement, but to show that some progress has been made in a comparatively new field, and it is hoped in the right direction. This will be the more important if we view coke as *becoming* and *destined to become the principal fuel in the metallurgy of iron.*

The Broad Top Coal Region occupies an isolated geographical position, standing 25 miles east from the Alleghany Field. It is associated with the latter by the structure of its coal, and more closely with the Cumberland Field by a similarity in the quality of coal.

Of the five principal coal beds of the Broad Top Field, two have been found peculiarly adapted to iron working—the 2d. and 3d. workable seams in the series. These seams possess, in a modified manner, the peculiar columnar structure so characteristic of the Alleghany coal. There is this difference, however, that the coal in Broad Top is shaped into rhomboidal blocks by well defined cleavage planes. The slates in both seams of coal are diffused through the coal in horizontal plates, occasionally presenting deposits of lenticular structure.

The sulphur is found mainly associated with these slates, though a small portion, in the form of thin scales, is found scattered through the pure coal. Ordinarily the coal from these two seams is regarded as very excellent and pure fuel.

The following table of analyses of the Broad Top Coals, made by Prof. W. T. ROTHERR, of Bethlehem, Pennsylvania, in 1864 will exhibit their general character.

	Fulton Seam, Edge Hill Mine.	Barnet Seam, Bedford Mine.	Kelly Seam. Cunard Mine.	Cook Seam, Broad Top Mine.	Comparison of Broad Top and Welsh coals for coking.	Broad Top Kelly Seam. Duvall,	Welsh.
Specific gravity at 4° C ...	1.351	1.311	1.318	1.313		1.39 coke,	1.29 coke,
Weight of Cubic yard in lb.,	2 280	2.212	2,224	2,216		65 p. c.	66 p. c.
Moisture expelled at 120°C.	.343	.920	.791	.783		....	....
Bit. and other vol. matter expelled at red heat	14.075	15.500	13.840	17.382		13.8	12.2
Sulphur	1.036	.771	.905	.884		0.9	0.0
Ashes	11.631	7.337	6 001	4 812		6.8	6 5
Fixed carbon.	72.915	75.472	78 463	76.140		78.5	80.4
	100.00	100.00	100 00	100.00		100.0	100.0

The Barnet seam (C), and the Kelly seam (D), of Broad Top, have their equivalents in the Alleghany beds in the Peacock (C), and in the Cement (D), seams,

* A paper read before the American Institute of Mining Engineers at the meeting at Hazleton, Pa., October, 1874.

at Johnstown. In other portions of the Alleghany field, the Peacock is known as the "Miller seam."

The Broad Top coal field is flanked on its east and west sides by outcrops of the secondary iron ores, brought to light by the sharp and repeated flexures in the "Juniata district."

Along the western edge of the coal field, three distinct horizons of iron ores occur: I. the Levant iron ore, near the base of the Surgent series; II. the twin bed of fossiliferous iron ore in the middle of the Surgent formation; and, lastly, III. the hematite iron ores, which occur in association with the lower limestones of No. VI.

ANALYSES OF THE IRON ORES FOUND ALONG THE WEST EDGE OF THE BROAD TOP COAL FIELD MADE BY J. BLODGET BRITTON, ESQ., AT THE IRON MASTERS' LABORATORY, PHILADELPHIA, IN 1869.

Locality.	Oxygen with Iron.	Water.	Insoluble siliceous matter.	Sulphur	Phosphorus.	Alumina	Lime.	Protoxide of Manganese.	Reference letter.	Metallic Iron in 100 parts	Remarks.
Hematite, near Bloody Run...	23.39	12.40	8 70	0 12	0.05	2 09	trace.	....	A.	52.93	Lump selected, over average, free from much clay.
Fossil, Marklesburg.....	17.64	3.80	29.99	0 01	P. 68 O. .87 P. equ. 1.55	5 48	1 05	0.52	B.	39 90	Lump of dry block fossil ore, fair average quality.
Fossil, Wattson mine, near Bloody Run,	20.51	3 00	29.00	trace.	0.01	0.91	0 05	trace.	C.	46.41	Soft fossil ore, soft as clay, average quality.
Kemble Coal and Iron Company, Kern's mine, below Tatesville,	25 60	11.20	2.96	....	P. .28 O. .36 P. equ. 0.31	1.15	0 20	....	D.	58.12	Hydrated hematite, conchoidal fracture, selected.
Mammoth seam, Levant iron ore, near Marklesburg,	18 31	2 80	32.70	0 06	0.31	2.98	0.92	0 02	E.	41.42	Upper part of deposit, hard block ore, purple color.
Same locality, lower part of bed.	20.82	3 98	22 10	trace.	trace.	4.70	0.84	0 01	F.	47 09	Laminated, brick red, homogeneous, middle members of bed.

The hematite and fossiliferous iron ores of the region had been thoroughly tested in the old charcoal furnaces, which dotted the glens of the Juniata and its tributaries, producing a very superior quality of pig iron.

The character of these ores was not likely to make any serious difficulty in the blast furnace. The only element causing some anxiety was the quality of the coke likely to be produced from the coals of the Region.

The limestone for fluxing shows the following analysis by Mr. BRITTON:—

Carbonate of lime.....	92 12
Insoluble siliceous matter.....	2.48
Water	.68
Oxide of iron and alumina.....	1.08
Oxide of Manganese	trace.
Carbonate of magnesia and loss.....	3.64
	100

In full appreciation of all these facts, the late Hon. WILLIAM KELLY of Rhinebeck, New York organized, in 1868, the Kemble Coal and Iron Company of which he was President, the late L. T. WATTSON, of Philadelphia, Vice-President, and R. A. WIGHT, Esq., of New York City, Secretary and Treasurer.

The first furnace was put in blast July 3, 1869, followed by a second, March 4th, 1871. These furnaces are placed at Riddlesburg, near the confluence of Six Mile Run with the Juniata River, having the coal a few hundred feet up the Six Mile Run side, with the iron ores and limestone a short distance on the other side, the Broad Top Railroad occupying the intermediate belt, and affording every facility for transportation of stock to furnaces and pig iron to market.

The two furnaces erected on this place, designed by F. RUMPF, Esq., the engineer of the West Point Foundry Works, are models in every respect—in proportion, materials and workmanship, embracing all the modern improvements in hot blast ovens and blowing machinery. Their dimensions are as follows:—Height, 60 feet; width of bosh, 14 feet, and 8 feet wide at charging plates.

Notwithstanding the especial study of the materials entering into the manufacture of pig iron at this place, and the careful preparation of the furnaces, the resulting pig iron was not satisfactory, occasionally silvered or mottled with sulphur or silica, or both.

The late DANIEL WORDEN, Esq., who was the first superintendent of the furnaces, drew attention to the evident want of a purer fuel in order to secure satisfactory results. This led to an investigation as to the best method of purifying the coal, and resulted in adopting a coal crushing and washing apparatus.

The plan was elaborated at the West Point Foundry by Mr. RUMPF; it is a modification of the apparatus invented by Mr. BÉRARD, which was exhibited in London in 1851, and in Paris in 1855, drawing medals at both these great expositions.

The operation of this apparatus is based on two principles: 1st. That by crushing the coal into small pieces, the accompanying *slates* and *pyrites* will be *separated* from the *coal*; and 2nd. That the difference between the specific gravities of coal and its impurities will allow of their separation in a pulsating water bath; the coal being the lightest, will be carried to the top, whilst the slates, pyrites, etc., will be jarred to the bottom.

The apparatus was erected in 1873 near the two lines of coke ovens, between them and the mines. The water used for washing the coal is pumped from the Juniata River by an independent pumping engine.

The machinery of the coal washing apparatus is driven by a stationary engine

of 8 horse power. The coal is conveyed to, and brought from the washing-house by railroad dump cars, having convenient side doors for discharging their coal into the hopper at the crushing rolls and into the coke ovens. The annexed cross section, with the description of this apparatus will render its operations intelligible.

The coal to be cleansed is dumped into the hopper A, from the railroad car B, by a side door and over an iron schute, from whence it is diffused on the separator B, which is kept in agitation by the cam a. The large lumps, which will not pass through the 3-inch square openings in screen B, roll down to the screen platform C, where they are broken by a workman with a maul, and, falling through the grating, pass to the rolls D. D. The smaller lumps pass through the 3-inch meshes in agitator screen B, when they are further divided by screen b. The portion of the coal which will not pass through the half-inch holes in the latter screen, pass directly to the rolls D. D., whilst the very fine portion is carried under the rolls, down the schute C, into the receiver F.

The rollers D. D. have teeth or spurs set all over their circumference, each being about ½ inch high by ½ inch square. Their arrangement is such that the spurs of one roll mesh into those of the other. One of the crushing rolls has its pillow blocks set in slides, with rubber ball springs, so as to admit of a small horizontal movement to prevent the breaking of the teeth of the rolls by the passage of hard slates or rocks.

After passing the rolls, the crushed coal gravitates into the receiver F, whence it is elevated by the chain of buckets G, and delivered into the schutes H, through which it is carried into the separating pans J, composed of cast iron, with copper plate on top of grating, forming the bottom of this iron pan, which copper plate is filled with ⅛ inch holes, set close together. The pans are supplied with water conveyed into them by troughs, through which also the coal is carried.

The action of the piston K, which moves with quick, short strokes (120 per minute), forces the water through the coal and slate in rapid pulsations, lifting the pure coal upwards and onwards with the movements of the water until both are carried over the side of the pan at L, and thence over a grated schute into the railroad car M, on the track in front of the washer.

The impurities, being heavier than coal, sink to the bottom of the pan and are carried to its front interior angle, whence they are discharged by a valve, d, into the receiver N, from which they can be removed by a sliding bottom, f.

The movement of the coal in the pans is about 20 inches per minute, giving a continuous overflow of washed coal into the railroad cars.

This flow can be regulated by raising or lowering the front side of wash pan at L.

The main portion of water is drained from the coal by a zone of fine copper wire screen on schute, immediately under the discharge from wash pan at L. This water, charged with the very fine coal and dust, passes through g, and is conveyed by a trough, h, into a large tank alongside the washer, where the fine coal is permitted to settle, and is then shovelled into the railroad cars along with the coarser coal, and all carried and dumped into the coking ovens without further handling.

The washer, with three pans, is capable of cleansing 12½ net tons of coal per hour.

To supply one furnace with coke would require this apparatus to be run about 9 hours per day, or 18 hours to supply the two stacks when both are in blast.

The cost of machinery, gearing, motive power and independent steam pump, was $9,000.* Cost of erecting, $3,000. Making total cost of apparatus, when ready for work, $12,000

The cost of labor required at the washer in handling 1 ton of coal, is given by WILLIAM LANDER, Esq., Furnace Superintendent, at 18 cents, to which must be added the interest on the washing plant at 10 per cent., 3½ cents, making total cost of 1 net ton of washed coal, 21½ cents.

In addition to this, there is some waste of coal which should be taken into this calculation (a), the very fine coal carried away suspended in the discharge water, and (b) the fine coal escaping with the slates and other impurities. The amount of fine coal in the former is 30 pounds per ton, and in the latter 20 pounds per ton, making the total waste of fine coal from these sources 50 pounds per ton, or 2½ per cent.

The slates, pyrites and other impurities separated from the coal amount to 180 pounds per ton, or 9 per cent. The total, therefore, of slates, sulphur, &c., separated, and fine coal lost in the operation of washing, amount *to 230 pounds per ton, or 11½ per cent.*

The cost of this 230 pounds of coal and slate is 13½ cents, to which must be added the expense of the labor in washing and interest on apparatus, 21½ cents, *making the whole cost of labor and loss in washing one net ton of coal 35 cents.*

The next general inquiry leads to the consideration of the ascertained results which have followed the washing of the coal.

1st. *The volume of impurities removed from the coal, with its effect in producing a more uniform, denser and purer coke.*

And, 2d. The effects in the furnace in improving the quality of the pig metal, and in the increased yield of the furnace.

1st. The coal used at the Kemble furnaces is produced from the Kelly seam, the third workable bed in the lower coal measures.

* The machinery for this apparatus, as well as the blowing engines, &c., for furnaces, was made by Messrs. PAULDING, KEMBLE & Co., at the West Point Foundry Works, New York.

It is not regarded as quite as good a coal as its congener, the Barnet 100 feet below, but is, on the whole, a very excellent bed of coal, mined carefully by the company's coal superintendent, CAPT. TURNER. It is 3 to 4 feet thick, without any dividing bands of slate, and has no bony coal at roof. It is homogeneous throughout.

In obtaining sample of coal for analysis, care was taken to produce a fair average quality of coal with its impurities.

A vertical fluted cut was made on the face of the seam, from floor to roof, and the materials from this cut collected, powdered and mixed. The analyses of the coal, coke, pig iron &c., were made by THOMAS J. MORRELL, Esq., Chief Chemist of the Cambria Iron Co., at Johnstown, who has kindly assisted in this examination.

Analysis of Kelly coal, as it comes from the mine.

Fixed Carbon	71.11
Ash	7 50
Volatile matter	21.38
Sulphur in above-1 70.	99.99

After washing, the sulphur is reduced to 1.50 per cent., a decrease of 11.76 per cent. The reduction in the ash is much larger and will be manifest in the analysis of the coke.

About two thirds of the coal is crushed to pieces not quite as large as marbles, the balance is reduced to the fineness of coarse sand. Analyses for sulphur in these two classes showed the former to contain 1.75 per cent., and the latter 1.02 per cent.

MR. LANDER calculates that 1.6 net tons of coal are required to make 1 ton of coke.

Analysis of coke—from washed coal—40 to 50 small pieces collected, pounded and blended, giving a fair average.

Carbon	89.28
Ash	9 66
Sulphur	1.06
	100

The Sulphur in 1.6 tons of coal at 1.70 per cent. would give 2.72 in coke—the analysis shows 1.06, indicating a reduction of 1.66 or 67.03 per cent. by volatilization in coking.

This coke has a bright silvery appearance, is dense, sonorous and bears handling without breaking. The uniform quality of this coke is manifest. Few scales or wedges of slate are found in it. It is believed to be a very superior coke.*

The coal is dumped into the ovens as it comes from the washer, quite damp.

This suggests a question of the chemical effect produced by water in the process of coking, and whether the dry semi-bituminous coals do, or do not, require a proportion of moisture in a certain ratio to their want of bitumen. It is evident, also, that a limit must be reached in this, so that the volume of water in the crushed coal does not chill the ovens.

Hon. D. J. MORRELL, General Manager of the Cambria Iron Co., has just put in operation a very large and complete coal washing apparatus, at the Iron and Steel Works at Johnstown. He contemplates boring an artesian well to procure *salt water* for washing the coal, and assumes that a portion of the salt will go with the washed coal into the ovens, and that its vapors, coming in contact with those of the sulphur and pyrites, will disengage a portion of the sulphur, leaving the small residue in a harmless form of sulphuret of sodium.† In this way it is confidently expected to produce a very pure coke—at a very small increased cost.

2d. The effects in the furnace, in improving the quality of the pig iron, and in its increased yield of metal.

The pig iron produced with coke from unwashed coal was variable, depending on the quality of the coal from which the coke was made. The following analysis, it is believed, will exhibit its general character.

Analysis of pig iron at Kemble furnaces with coke from *unwashed coal:*

Iron	93.27
Silicon	3.73
Phosphorus	not determined.
Sulphur	0 23

The following determinations show, in a very striking manner, the improved quality of the pig iron made with coke from the *washed coal:*

Silicon	2.09
Phosphorus	0.64
Sulphur	0 03

* In MR. BRITTON'S valuable circular to furnace proprietors, published in the ENGINEERING AND MINING JOURNAL of June last, an analysis of a sample of Connellsville coke, composed of forty-nine different pieces, is given "*as a standard whereby the value of other cokes may be ascertained:*"

Moisture	.490	Phosphoric acid (Thos.	.013) .029
Ash	11.332	Carbon (by difference)	87.456
Sulphur	.693		

† "The rationale of this process being, that the bi-sulphuret of iron is by the heat converted into sulphur and proto-sulphuret of iron; the latter, when salt is added, coming in contact with the vapors of salt, is converted into proto-chloride of iron, sulphuret of sodium being formed simultaneously.

"The proto-chloride is then said to be decomposed into sub-per-chloride with the evolution of chlorine, which, acting on the sulphuret of sodium, reproduces chloride of sodium and chloride of sulphur, which latter is disengaged, leaving much less sulphur in the residue, and that in a harmless form of sulphuret of sodium."—*Chemical Technology*—DRS. RONALDS AND RICHARDSON. *From Transactions of North of England Institute of Mining Engineers*, Vol. viii, 1860.

The increase in the volume of iron with the decrease of the silicon and sulphur are quite evident.*

The pig iron is gray, soft, granular, open, and is classified as No. 1 extra.

The only element preventing its use in making Bessemer steel is the slight excess of phosphorus.

Of the enhanced value per ton of the pig metal, by washing the coal, it is difficult to decide accurately, the more especially during a time like the present, when great depression exists in the iron industries. On mature deliberation it has been estimated by experts in the iron trade, that its increased market value is at least $4 per ton. This is sustained by the increasing favor it is meeting with, even in a weak market.

The yield of pig iron from one furnace, per week, previous to washing the coal, was 140 tons, as a fair average, supporting a blast of 3½ to 4 pounds per square inch.

The yield per week, of the same furnace, from washed coal, is 180 tons, calculated as a fair average product, exhibiting an increase of 40 tons per week, or 28.57 per cent.† The blast has also been increased to 5 and 5½ pounds per square inch.

The following statement, furnished by W. LANDER Esq., Superintendent of the Kemble furnaces, exhibits the make of pig iron by one stack (14 feet bosh., 60 feet high) running on fossil ore with coke made from washed coal, during the month of November, 1874:

First week, 7th	206½	tons
Second " 14th	204½	"
Third " 21st	216	"
Fourth " 28th	208½	"
Two days, 29th and 30th	59½	"
Total month's product	875	"

The pig iron made is all foundry iron except 150 tons.

The cause of this large increase in the yield of the furnace is evident, as it requires 1.6 tons of coal to make 1 ton of coke, and 2 13 tons of coke to melt 1 ton of pig iron, or 3 48 tons of coal coked. Then, 3.48×180 tons gives 626.40 tons of coal made into coke for a week's work. From this coal there has been taken, in the crushing and washing process, 180 pounds per ton, or 9 per cent., which gives 56 37 tons of impurities removed from the above coal.

From this will require to be deducted the volatile matter in this material, estimated at 22 per cent., or 12 40 tons, leaving 43.97 tons of solid matter withdrawn from the work of the furnace, resulting, as shown, in the increase of 50 tons of pig iron in a week.

Or, in other words, it is a transfer of the work of the furnace. In place of melting and volatilizing 56.37 tons of worthless and injurious materials, as hitherto, it now melts *iron ore* with the foregoing results.

The value of this coal washing improvement will be more apparent when the savings in the furnace operations *during a week* are considered.

140 tons of pig metal increased in value	@$4 per ton.	$560 00
40 tons furnace increase	@$9 " "	$360 00
		$920 00

From which deduct

Cost of crushing and washing 626.40 tons of coal for coking, at 35c. per ton	$219 24
Net gain by washing	$700 76
Or, for one year ($700 76×52)	$36 408.32

Some coal washing has been done in Pittsburgh, with satisfactory results, and there appears to be, at the present time, an awakening amongst ironmasters to the importance of this cleansing of the fuel.

As before noticed, Mr. MORRELL has just put in operation an extensive apparatus for washing coal at the Cambria Iron and Steel Works, at Johnstown, with the view of preparing fuel carefully for the new furnaces designed to produce Bessemer pig iron.

This washer is very complete, and appears to clean the coal in a superior manner. It will cost $20,000 to $25,000 when completed, and will wash 200 tons per day.

The most impressive fact in the whole washing process is *the unexpected large* quantity of slate and impurities.

The old legend of coal "absolutely free from slates and sulphur" has been hopelessly ruined, the pile of slates and pyrites at a coal washer burying it out of sight in total oblivion.

And this applies to coal of undoubted good quality, reasonably free from impurities.

The truth must, however, exert a beneficial influence on leading furnace men to purge their fuel of all foreign matter.

And this cleansing process must, from the nature and extent of our coal deposits, become an important branch of industry.

Its importance will be more appreciated when it is considered that in the United States there are at least 230,000 square miles of bituminous and semi-bituminous coal and only 472 square miles of anthracite coal, thus surely indicating the great unfailing supply in the vast area of the bituminous coals.

But the washing process, as at present arranged, cannot be applied to all classes of "soft coals." In Northern Ohio, the Youngstown coal is used with success in the furnace raw, the Indiana block coal also, and perhaps more will be developed of similar qualities.

We have also zones of very pure coal in the Alleghany and other fields. The *Miller* seam near Gallitzin, used at the Remington furnaces, does not require washing, as excellent Bessemer pig iron is being made by coke from this coal as it comes from the mine. The Connellsville coal is also an example in point, as it makes a very fine coke unwashed.

But these are exceptional cases. The great bulk of the soft coals, especially from the *Lower Measures*, will require cleansing. The small cost of this work will hasten its general adoption, rendering beds of coal valuable which have hitherto been condemned for furnace use.

The extent of cleansing the coal should be kept in view, for it is now evident that there is no *known law* in the way of *perfect work; sulphur and slates can be removed* and at a *mere nominal cost.*

Some conflicting views exist in regard to the method of treating coals under the different conditions of admixture with impurities. Some coals have these concentrated in lenticular deposits, whilst others have them disseminated in plates and scales.

This will evidently induce modifications in the apparatus and treatment in washing to meet the varying cases.

In Europe, M. BÉRARD's apparatus has attained considerable notice, particularly on the Continent; whilst in England and Scotland, "Mackworth's Coal Purifier" has been established, "*cleaning from 20 to 100 tons of coal per day at a cost not exceeding 3d per ton and with a loss not exceeding 2 per cent. of coal.*"

President R. P. PARROTT and his co-workers of the Kemble Coal and Iron Company deserve the gratitude of ironmasters and ironworkers for the introduction of an apparatus for cleaning the fuel, improving the quality of iron, and radiating its benefits in so many directions in an industry contributing so largely to the comfort and civilization of mankind.

DISCUSSION.

In answer to a question, Mr. FULTON replied that the coal was coked in the old beehive ovens, but that at East Broad Top and at Cambria, Belgian ovens were used.

Mr. PECHIN remarked, that while Mr. PARROTT deserved great credit for inaugurating coal washing at Broad Top, Messrs. JONES & LAUGHLIN, of Pittsburgh, have had coal washers in operation for some years, with good results.

The subject of the value of salt as a desulphurizer in coking having been brought up, Mr. I. LOWTHIAN BELL said that the use of salt had been patented in England by Mr. CRACE CALVERT some years ago, and that he had given the matter a fair trial. He failed to discover any effect whatever from its use. Mr. BELL further remarked that the subject of coal washing was of the greatest importance and magnitude in England. The heaps of coal-dust, or "duff," differed from fine anthracite in that it was liable to be destroyed by spontaneous combustion. As to the relative value of coke made from washed and unwashed coal, he was of the opinion that the coke made from coal that did not require washing was superior to that made from washed coal. Some of the English coal beds furnished coal containing but 5 per cent. of ash and the coke made from it is of the finest quality. The plan of washing employed in England was very simple. The apparatus consists of a long wooden box, say 25 to 30 feet long, and 2 to 3 feet wide, open at the top and inclined about 3 inches to the yard. At intervals are placed dams 3 to 4 inches high. This constitutes a true washing machine, and operates on the same principle as the one which has just been described. The coal is crushed and discharged in this sluice, where it meets a stream of water. The heavier slate and pyrites are intercepted by the dams near the top, while the lighter coal passes further down. When about half the dams are full, the operation is stopped and the box cleaned up. Experiments were made with machine rakes, but it was found more advantageous to employ manual labor. About 400 to 500 tons a day could be treated on one of these simple machines, and the ash of the coal reduced from 12 to 6 per cent.

The finest coal which passes out of the box was collected in settling ponds, and was coked in admixture with that collected in the box. In giving figures he spoke from memory only, and did not wish them taken precisely. He thought that the cost of washing in one of these boxes would not exceed one half of that mentioned by Mr. FULTON. As to the practical gain of washing coal with respect to the value of the coke for iron making, it amounted to more than the mere elimination of so much earthy matter. If there was 12 per cent. ash in a coal it was a very simple matter to calculate how much extra fuel must be employed to flux it in the blast furnace, and it would be found that the advantage gained by washing was far greater than the mere saving of this extra fuel.

He thought it was to be referred mainly to the physical character of the coke produced. The action of heated carbonic acid on coke differs according to its hardness and density: the harder the coke the less actively is it attacked and taken up by the carbonic acid. Now, the coke from washed coal is harder and more compact than that made from impure coal and, consequently, the carbonic acid in the furnace is less affected than if the coke were soft and porous. It is to this cause that the gain in washing is mainly to be attributed.

Mr. COXE suggested that the hard and glassy anthracite would be therefore found better adapted to the blast furnace, than the dull and softer varieties.

Mr. FIRMSTONE replied that this would doubtless be the case, but that the glassy variety decrepitated so much in the furnace that it could not be used advantageously.

Mr. BELL said that if typical specimens of anthracite were furnished him he would gladly undertake the investigations of their properties with reference to blast furnace use and communicate the results to the Institute.

* In the production of one ton of pig iron, there are used in this furnace as follows: coke, 2.13; limestone, 1.18; and fossiliferous iron ore, 3.34, net tons.

† The yield of this furnace during the months of August and September last, was 365 and 327 tons respectively,—mostly foundry iron.

Per ton of 2000 lb.

	Slack.	Nut & Slack.	Nut.	Lump
Connelsville coke				6 50
Sterling cannel				6 00
Red Bank				5 75
Youghiogheny coal for gas				5 50
Briar Hill coal		3 25		5 00
Fairmount "		3 25	3 75	4 25
Catfish "		3 25	3 75	4 25
Stoneboro "	2 75		3 75	

Briar Hill coal, and Stirling and Red Bank cannels retail at $7 50; all other coals $1 per ton above wholesale prices.

Anthracite f. o. b. vessel.

Grate	6 70	Stove	7 15
Egg	6 70	Chestnut	6 65

Retail prices delivered and screened, $1 per ton additional.

Chicago, Ill. Dec. 15, 1874.

Specially reported by Messrs. RENO & LITTLE, Coal Merchants.

No change in prices of coal.

Retail prices per ton of 2000 lb. delivered to buyer.

		BITUMINOUS.	
Lehigh Lump	$10 75	Briar Hill and Erie	7 50@ ...
Lehigh prepared and car load lots	10 25	Walnut Hill (W. Va.)	6 50@ ...
Lackawanna, Wilkes-Barre and Pittston,*		Midway (West Va.)	6 50@ ...
Grate, egg, and chestnut	9 50	Cannel	8 00@ 9 00
Stove or range	10 00	Blossburg	8 00
		Indiana Block	6 00
		Hocking "Brooks"	6 00
		Wilmington and Illinois	5 00

*75 cents off these prices for car load lots to country dealers and manufacturers.

Cleveland, O. Dec. 16, 1874.

Prices unchanged—business very quiet. Miners are all out in the Salineville District. Mine owners are asking a reduction of 10 cents per ton in price of mining, and miners are objecting to it. Operators, however, are confident of carrying their point by January 1st at latest.

Reported by our Special Correspondent.

Per ton of 2000 lb. on cars.

Youghiogheny, l'p	$4 40	Columbiana	$3 00
Youghiogheny, nut	3 40	Strip Vein	3 20
Briar Hill, according to quality	$3 85 to 4 00	Mountain Blossburg (blacksmith)	5 50
Massillon	3 65	American Cannel Coal Co.s Cannel	4 50
Hocking Valley	3 25		
Straitsville	3 25		
Anthracite, Lackawanna on cars, Egg			$6 85
" " " " Stove			7 50
" " " " Chestnut			7 00
Youghiopheny Coke, " " here			5 25
Connellsville " " "			5 50

50 to 75 cents per ton additional for delivery at retail.

Cincinnati, O. Dec. 16, 1874.

Please continue last report.

Per ton of 2000 lb.

	Bush.	Ton.
Youghiogheny, or Pittsburgh, afloat	10 c.	—
Pomeroy coal	7½@8 c.	—
Cannel coal	18c.	—
Semi Cannel	11 c.	—

The following are retail prices delivered:

Youghiogheny	13 c.	
Pomeroy	11 c.	
Cannel	24 c.	—
Kanawha Semi Cannel	15c.	—
Anthracite	$9 50@	—
Foundry coke	10c.	—
Soft coke	8c.	—

Detroit, Mich. Dec. 16, 1874.

Specially reported by Messrs. ROBINSON & KEYS, dealers in all kinds of coal.

Our report of last week will answer very well for this. Would like to report something different, but do not expect much improvement before January. Market firm. Quotations unchanged.

Per ton of 2000 lb.

Lehigh Lump, per ton	$10 50	Blossburg	8 50
Lehigh " prep. sizes	10 00	Briar Hill	7 50
Wilkes-Barre, Grate and Egg	9 00	Willow Bank	7 00
Wilkes-Barre, Stove and Nut	9 50	Erie	7 50
		Massillon	7 00

Erie, Pa. Dec. 16, 1874.

Reported by our Special Correspondent.

Wholesale, per ton of 2,000 lb.

Bituminous f.o.b.

Briar Hill lump	$4 00	Beaver lump	$4 00

Indianapolis, Ind. Dec. 7, 1874.

Specially reported by Messrs. H. MCCOY & Co.

Per ton of 2000 lb.

BITUMINOUS.

Wholesale on board cars in city.

Best Block coal	$3 10	Indiana cannel	6 75
Best Highland	2 50	Hocking Valley	3 25
Block Nut, per car	20 00	Youghiogheny	6 00
Highland " "	18 00	Blossburg (smithing)	7 30
Block slack, per car load	15 00	Piedmont "	7 75
Peytona, cannel per ton	8 75	Gas coke, ... per bushel	10c

ANTHRACITE (Lackawanna).

Grate	$8 70	Chestnut	8 60
Egg	8 70	Stove	8 85

Retail, per bushel of 70 lb.

Block	16c.	Peytona Cannel	32c.
Highland	14	Indiana "	26
Highland Nut, dom. use	12	Youghiogheny	26
Block " "	12	Blossburg	27
Slack, steam, "	8	Piedmont	30
Block & Highl'd Mt. steam	9		

ANTHRACITE.

	per ton.		per ton.
Grate	$11 00	Stove	$11 00
Egg	11 00	Chestnut	11 00

Louisville, Ky. Dec. 15, 1874.

Specially reported by Messrs. BYRNE & SPEED.

The price of Pittsburgh coal in the river is not quite as firm as it was some time since; the retail demand has increased very much since the arrival of last run of coal.

The Rail Roads carrying Kentucky coal have also reduced rates of freight.

Our retail rates are as follows:

Pittsburgh, per load of 1900 lb	$3 50
Pomeroy	
Buckeye Cannel	5 00
Peytona Cannel	5 75
Nut and Slack	2 50
Kentucky lump, per load	
" nut, "	
" Slack "	
City-made Coke, per bushel	10c
Kentucky on cars at wholesale, per bush.	9½
Anthracite, per ton	$10 to $10 50

Milwaukee, Wis. Dec. 13, 1874.

Specially reported by Messrs. R. P. ELMORE & Co.

Retail prices per ton of 2000 lb.

Lehigh Lump	$10 00	Briar Hill, select	$8 50
Lehigh Prepared	10 50	Blossburg	8 00
Lackawanna	9 50	Pittsburgh	7 50

New Orleans, La. Dec. 12, 1874.

Please continue our quotations of 5th inst. No change whatever in the market.

Pittsburgh coal, retail, per bbl	75c
" wholesale	45c.
" to steamboats, per box	60c.
" to manufacturers, per bbl	65c.
" shipments per hhd	$7 00
Anthracite, retail, per ton	$12 50
" wholesale per ton	$8 00
Spadra (Arkansas) coal, retail, per bbl	75c.
Mt. Carbon, wholesale, per bbl	45c.
" retail per bbl	65c.
Virginia Cannel, per bbl	90c.
Scotch Cannel, per bbl	1 00

Pittsburgh, Pa. Dec. 14, 1874.

Reported by our Special Correspondent.

Trade continues very dull. The lock-out of the puddlers, which commenced on Monday, 7th inst., is quite general here, but two or three mills continuing to pay the old price, $6 per ton. Both sides appear determined.

Prices remain unchanged, except Connellsville coke, which may be quoted at $2 50, and Youghiogheny coke at $2 25 per ton.

Sig. GUSCETTI, who had charge of the Italian miners "routed" from ARMSTRONG'S mines on the Connellsville railroad, is endeavoring to have their case investigated by the interference of the representative of the Italian government at Washington, but he might as well "hang his harp upon the willows," as to try to bring the kind of offenders in question to judgment.

Per ton of 2000 lb. and Bushel of 76 lb.

	per ton.		per ton
Youghiogheny coal	$2 00	Pittsburgh retail delivered per bushel	9c@10c
" coke	2 50		
Connellsville coal	2 10	Anth'cite on cars Lehigh	$7 75
" coke	2 75	" " Wilkes-Barre	6 75
Pittsburgh coal	1 85		

Twenty-five to fifty cents per ton additional for delivery.

St. Louis, Mo. Dec. 14, 1874.

Specially Reported by the COLLINSVILLE COAL AND MINING COMPANY.

ANTHRACITE.

Per ton of 2000 lb.

	City delivery.
Lehigh Lump	$13 50
Lackawanna and Wilkesbarre	12 50
Semi Anthracite	9 50

BITUMINOUS.

Per ton of 2000 lb.

	E. St. Louis.	City delivery
Washington Indiana—smithing	$4 00	$4 87
O'Fallon, Ills	2 00	3 00
Collinsville and Belleville, Ills	1 75	2 75
Indiana Cannel	6 00	7 00
Missouri Cannel		5 00

Retail, 25c. per ton additional.

San Francisco.

From the *Commercial Herald* of December 3.

Imports from January 1st to December 1:

Anthracite, tons	11,843	Vancouver Island, tons	46,805
Australian, tons	126,068	Bellingham Bay, tons	13,185
Coos Bay, tons	43,725	Rocky Mountain, tons	343
Cumberland, tons	15,033	Seattle, tons	4,535
English, tons	25,301	Mt. Diablo (10 mos.)	168,182

The market, both present and prospective, is strong, by reason of light shipments making at the Colonies and elsewhere for this port. Imports for the week include the *Garnet's* cargo of Cumberland from Baltimore, 1158 tons; *Blue Jacket*, 1857 tons Wellington from Vancouver Island; steamer *Empire*, 575 tons Coos Bay; *Columbia*, 1260 tons from New South Wales—this cargo, we are told, sold prior to arrival at $10 50; *Favorita*, 1460 tons Scotch from Leith; *Thirlmere*, 2500 do.—also sold to arrive, private; *Loch Cree* from Sydney, 1165 tons; *Herald of the Morning*, 350 tons, etc. We quote Australian spot cargoes at $11@$11 25; Wellington screened, $11@$11 50; Nanaimo, same; Bellingham Bay, $8 50; 1158 tons Cumberland, ex-ship, sold private. The *Andromeda*, from Liverpool, adds 2100 tons to our stock.

Toledo, Ohio. Dec. 14, 1874.

Specially reported by Messrs. GOSLINE & BARBOUR.

Per ton of 2000 lb.

	Retail.		Retail.
Wilkes-Barre and Scranton, Large and Small Egg	$8 35	BITUMINOUS. Blossb'g and Cumberl'd	$8 00
Stove	8 50	Massillon Lump	6 00
Chestnut	8 35	Briar Hill	7 00
Lehigh Lump	10 00	Straitsville	3 75
		Hocking Valley	4 00

Soft coal screened retails from $4 00 to $6 00, according to quality.

Montreal. Dec. 16, 1874.

Reported by our Special Correspondent.

The close of navigation, causing a cessation of all imports for six months, has, as usual, occasioned an advance in price, but only a moderate one, as stocks of coal are large and demand very limited. The course of our market has proved very difficult to forecast, estimates of supply and probable demand having repeatedly been found fallacious. At present the stock of soft coal would seem ample for all contingencies; but though anthracite is in large supply, a cold winter and revival of manufactures might reduce stocks to a small margin before next open water.

The chief sensation with regard to coal has been caused by a fire on the premises of the New City Gas Company. Spontaneous combustion took place in a pile of 7,000 tons of coal from the International Mine, Cape Breton, and an immense conflagration ensued. A speculator bought 1,000 tons of inferior gas coal at an advance of one dollar in price, it being reported that 14,000 tons of coal were consumed. The result, however, proves that the loss is only 1,000 tons, and as the Gas Company need to make no purchases, the market has resumed its former condition. Quotations are:

Per ton of 2,240 lb.

Scotch Steam	$4 50@4 75	Cape Breton Steam	$4 00
Pictou "	4 25	Newcastle Smiths	5 50
Anthracite at retail, 2,000 lb., delivered, less 5 per cent.			
Egg	$8 00	Nut	$8 00
Stove	8 50	Chestnut	7 75

Halifax, N. S. Dec. 14, 1874.

Reported by our Special Correspondent.

We have nothing to add to our advices of last week; prices of coal here continue about the same.

Prices per ton of 2240 lb. in gold.

Sydney (old mines)	$4 50	Little Glace Bay	3 50
Gowrie	3 50	Blockhouse	4 00
Victoria	3 50	Albion (at Railroad)	4 25

Toronto, Ont. Dec. 14, 1874.

Reported by our Special Correspondent.

ANTHRACITE.

	per ton.		per ton.
Broken	$7 65	Chestnut	$7 65
Egg	7 65	Lehigh	9 00
Stove	8 15		

BITUMINOUS.

Blossburgh	7 50	Screenings	5 00
Briar Hill	7 00	Soft Nut	5 50

Freights.

Rates from Elizabethport, Port Johnston, &c., are reported firmer, 90c. and 95c. having been paid from these points to Providence. We note a few inquiries for freights to Boston, with a scarcity of vessels. No change has transpired in Philadelphia or Baltimore and Georgetown rates, and quotations for these points remain nominally as before.

REVIEW OF THE BRITISH COAL AND IRON TRADES.

Compiled from our exchanges bearing date to November 28, 1874.

Though stocks of iron generally throughout England appear light, business is dull, and prices rather receding. Bessemer pig has declined 2/ 6d., or to £4 12/ 6d @£4 15/ at Barrow. The rail mills are doing very little, particularly in Wales, and many large Continental orders have been taken in Belgium and France at very low prices. We hear of a Belgian mill offering to fill an order of 8,800 tons iron rails at £6 18/ f. o. b. in Antwerp; £7 is asked by some of the heaviest makers in Belgium. At these prices the English cannot produce iron rails, but they are under-selling the Belgians in steel rails, which have recently been delivered in Manchester at £9 18/ 4d., while the lowest price at Antwerp is £10.

Tenders for about 18,000 tons of steel ingots, to be delivered at the rate of 1,000 per month, are invited by Belgian rail mills; the price must not exceed £7 13/—ex ship *Antwerp*.

At Middlesbrough, No. 1 pig is 62/; No. 3, 64/; No. 4 forge, 58/@58/ 6d. Manufacturing fuel is quoted at 16/@17/.

There are some 6,000 or 7,000 men unemployed in the North of England.

At Wolverhampton bars are offered at from £95/ to £10 10/; all mine hot blast pigs, £5@£5 5/; cinder pigs, £3 5/. Furnace coal, 11/ per ton.

In Scotland.—The stock in CONNAL'S stores is increasing, being now 32,235 tons. Prices of warrants remained at 84/@ 85/.

IRON MARKET REVIEW.

New York.

Dec. 18, 1874.

American Pig.—As might be expected at this season of the year, the demand is exceedingly light, and the business actually being done is confined to a very few. Some makers are asking $26 for No. 1 iron, but there is an abundance of first class iron offering at $25, with good brands as low as $24, so that those asking the first mentioned figure may be considered out of the market. When pig iron was at $30 a ton, a number of speculators expressed their determination to purchase liberally should it decline to $25; but they must have changed their views, as there appears to be no demand whatever from that source, and it is doubtful if two or three

The increase in the volume of iron with the decrease of the silicon and sulphur are quite evident.*

The pig iron is gray, soft, granular, open, and is classified as No. 1 extra.

The only element preventing its use in making Bessemer steel is the slight excess of phosphorus.

Of the enhanced value per ton of the pig metal, by washing the coal, it is difficult to decide accurately, the more especially during a time like the present, when great depression exists in the iron industries. On mature deliberation it has been estimated by experts in the iron trade, that its increased market value is at least $4 per ton. This is sustained by the increasing favor it is meeting with, even in a weak market.

The yield of pig iron from one furnace, per week, previous to washing the coal, was 140 tons, as a fair average, supporting a blast of 3½ to 4 pounds per square inch.

The yield per week, of the same furnace, from washed coal, is 180 tons, calculated as a fair average product, exhibiting an increase of 40 tons per week, or 28.57 per cent.† The blast has also been increased to 5 and 5½ pounds per square inch.

The following statement, furnished by W. LANDER Esq., Superintendent of the Kemble furnaces, exhibits the make of pig iron by one stack (14 feet bosh., 60 feet high) running on fossil ore with coke made from washed coal, during the month of November, 1874:

First week, 7th	206½	tons
Second " 14th	204½	"
Third " 21st	216	"
Fourth " 28th	208½	"
Two days, 29th and 30th	59½	"
Total month's product	875	"

The pig iron made is all foundry iron except 150 tons.

The cause of this large increase in the yield of the furnace is evident, as it requires 1.6 tons of coal to make 1 ton of coke, and 2 13 tons of coke to melt 1 ton of pig iron, or 3 48 tons of coal coked. Then, 3.48×180 tons gives 626.40 tons of coal made into coke for a week's work. From this coal there has been taken, in the crushing and washing process, 180 pounds per ton, or 9 per cent., which gives 56 37 tons of impurities removed from the above coal.

From this will require to be deducted the volatile matter in this material, estimated at 22 per cent., or 12 40 tons, leaving 43.97 tons of solid matter withdrawn from the work of the furnace, resulting, as shown, in the increase of 50 tons of pig iron in a week.

Or, in other words, it is a transfer of the work of the furnace. In place of melting and volatilizing 56.37 tons of worthless and injurious materials, as hitherto, it now melts *iron ore* with the foregoing results.

The value of this coal washing improvement will be more apparent when the savings in the furnace operations *during a week* are considered.

140 tons of pig metal increased in value	@$4 per ton.	$560 00
40 tons furnace increase	@$9 " "	$360 00
		$920 00

From which deduct

Cost of crushing and washing 626.40 tons of coal for coking, at 35c. per ton	$219 24
Net gain by washing	$700 76
Or, for one year ($700 76×52)	$36 408.32

Some coal washing has been done in Pittsburgh, with satisfactory results, and there appears to be, at the present time, an awakening amongst ironmasters to the importance of this cleansing of the fuel.

As before noticed, Mr. MOBBELL has just put in operation an extensive apparatus for washing coal at the Cambria Iron and Steel Works, at Johnstown, with the view of preparing fuel carefully for the new furnaces designed to produce Bessemer pig iron.

This washer is very complete, and appears to clean the coal in a superior manner. It will cost $20,000 to $25,000 when completed, and will wash 200 tons per day.

The most impressive fact in the whole washing process is *the unexpected large* quantity of slate and impurities.

The old legend of coal "absolutely free from slates and sulphur" has been hopelessly ruined, the pile of slates and pyrites at a coal washer burying it out of sight in total oblivion.

And this applies to coal of undoubted good quality, reasonably free from impurities.

The truth must, however, exert a beneficial influence on leading furnace men to purge their fuel of all foreign matter.

And this cleansing process must, from the nature and extent of our coal deposits, become an important branch of industry.

Its importance will be more appreciated when it is considered that in the United States there are at least 230,000 square miles of bituminous and semi-bituminous coal and only 472 square miles of anthracite coal, thus surely indicating the great unfailing supply in the vast area of the bituminous coals.

But the washing process, as at present arranged, cannot be applied to all classes of "soft coals." In Northern Ohio, the Youngstown coal is used with success in the furnace raw, the Indiana block coal also, and perhaps more will be developed of similar qualities.

We have also zones of very pure coal in the Alleghany and other fields. The *Miller* seam near Gallitzin, used at the Remington furnaces, does not require washing, as excellent Bessemer pig iron is being made by coke from this coal as it comes from the mine. The Connellsville coal is also an example in point, as it makes a very fine coke unwashed.

But these are exceptional cases. The great bulk of the soft coals, especially from the *Lower Measures*, will require cleansing. The small cost of this work will hasten its general adoption, rendering beds of coal valuable which have hitherto been condemned for furnace use.

The extent of cleansing the coal should be kept in view, for it is now evident that there is no *known law* in the way of *perfect work; sulphur and slates can be removed* and at a *mere nominal cost.*

Some conflicting views exist in regard to the method of treating coals under the different conditions of admixture with impurities. Some coals have these concentrated in lenticular deposits, whilst others have them disseminated in plates and scales.

This will evidently induce modifications in the apparatus and treatment in washing to meet the varying cases.

In Europe, M. BÉRARD'S apparatus has attained considerable notice, particularly on the Continent; whilst in England and Scotland, "Mackworth's Coal Purifier" has been established, "*cleaning from 20 to 100 tons of coal per day at a cost not exceeding 3d per ton and with a loss not exceeding 2 per cent. of coal.*"

President R. P. PARROTT and his co-workers of the Kemble Coal and Iron Company deserve the gratitude of ironmasters and ironworkers for the introduction of an apparatus for cleaning the fuel, improving the quality of iron, and radiating its benefits in so many directions in an industry contributing so largely to the comfort and civilization of mankind.

DISCUSSION.

In answer to a question, Mr. FULTON replied that the coal was coked in the old beehive ovens, but that at East Broad Top and at Cambria, Belgian ovens were used.

Mr. PECHIN remarked, that while Mr. PARROTT deserved great credit for inaugurating coal washing at Broad Top, Messrs. JONES & LAUGHLIN, of Pittsburgh, have had coal washers in operation for some years, with good results.

The subject of the value of salt as a desulphurizer in coking having been brought up, Mr. I. LOWTHIAN BELL said that the use of salt had been patented in England by Mr. GRACE CALVERT some years ago, and that he had given the matter a fair trial. He failed to discover any effect whatever from its use. Mr. BELL further remarked that the subject of coal washing was of the greatest importance and magnitude in England. The heaps of coal-dust, or "duff," differed from fine anthracite in that it was liable to be destroyed by spontaneous combustion. As to the relative value of coke made from washed and unwashed coal, he was of the opinion that the coke made from coal that did not require washing was superior to that made from washed coal. Some of the English coal beds furnished coal containing but 5 per cent. of ash and the coke made from it is of the finest quality. The plan of washing employed in England was very simple. The apparatus consists of a long wooden box, say 25 to 30 feet long, and 2 to 3 feet wide, open at the top and inclined about 3 inches to the yard. At intervals are placed dams 3 to 4 inches high. This constitutes a true washing machine, and operates on the same principle as the one which has just been described. The coal is crushed and discharged in this sluice, where it meets a stream of water. The heavier slate and pyrites are intercepted by the dams near the top, while the lighter coal passes further down. When about half the dams are full, the operation is stopped and the box cleaned up. Experiments were made with machine rakes, but it was found more advantageous to employ manual labor. About 400 to 500 tons a day could be treated on one of these simple machines, and the ash of the coal reduced from 12 to 6 per cent.

The finest coal which passes out of the box was collected in settling ponds, and was coked in admixture with that collected in the box. In giving figures he spoke from memory only, and did not wish them taken precisely. He thought that the cost of washing in one of these boxes would not exceed one half of that mentioned by Mr. FULTON. As to the practical gain of washing coal with respect to the value of the coke for iron making, it amounted to more than the mere elimination of so much earthy matter. If there was 12 per cent. ash in a coal it was a very simple matter to calculate how much extra fuel must be employed to flux it in the blast furnace, and it would be found that the advantage gained by washing was far greater than the mere saving of this extra fuel.

He thought it was to be referred mainly to the physical character of the coke produced. The action of heated carbonic acid on coke differs according to its hardness and density: the harder the coke the less actively is it attacked and taken up by the carbonic acid. Now, the coke from washed coal is harder and more compact than that made from impure coal and, consequently, the carbonic acid in the furnace is less affected than if the coke were soft and porous. It is to this cause that the gain in washing is mainly to be attributed.

Mr. COXE suggested that the hard and glassy anthracite would be therefore found better adapted to the blast furnace, than the dull and softer varieties.

Mr. FIRMSTONE replied that this would doubtless be the case, but that the glassy variety decrepitated so much in the furnace that it could not be used advantageously.

Mr. BELL said that if typical specimens of anthracite were furnished him he would gladly undertake the investigations of their properties with reference to blast furnace use and communicate the results to the Institute.

* In the production of one ton of pig iron, there are used in this furnace as follows: coke, 2.13; limestone, 1.18; and fossiliferous iron ore, 3.31, net tons.

† The yield of this furnace during the months of August and September last, was 355 and 357 tons respectively—mostly foundry iron.

Per ton of 2000 lb.

	Slack.	Nut & Slack.	Nut.	Lump
Connelsville coke				6 50
Sterling cannel				6 00
Red Bank				5 75
Youghiogheny coal for gas				5 50
Briar Hill coal		3 25		5 00
Fairmount "		3 25	3 75	4 25
Catfish "		3 25	3 75	4 25
Stoneboro "	2 75		3 75	

Briar Hill coal, and Stirling and Red Bank cannels retail at $7 50; all other coals $1 per ton above wholesale prices.

Anthracite f. o. b. vessel.

Grate	6 70
Egg	6 70
Stove	7 15
Chestnut	6 65

Retail prices delivered and screened, $1 per ton additional.

Chicago, Ill. Dec. 15, 1874.

Specially reported by Messrs. RENO & LITTLE, Coal Merchants.

No change in prices of coal.

Retail prices per ton of 2000 lb. delivered to buyer.

		BITUMINOUS.	
Lehigh Lump	$10 75	Briar Hill and Erie	7 50@ ....
Lehigh prepared and car load lots	10 25	Walnut Hill (W. Va.)	6 50@ ....
Lackawanna, Wilkes-Barre and Pittston,*		Midway (West Va.)	6 50@ ....
Grate, egg, and chestnut	9 50	Cannel	8 00@ 9 00
Stove or range	10 00	Blossburg	8 00
		Indiana Block	6 00
		Hocking " Brooks"	6 00
		Wilmington and Illinois	5 00

*75 cents off these prices for car load lots to country dealers and manufacturers.

Cleveland, O. Dec. 16, 1874.

Prices unchanged—business very quiet. Miners are all out in the Salineville District. Mine owners are asking a reduction of 10 cents per ton in price of mining, and miners are objecting to it. Operators, however, are confident of carrying their point by January 1st at latest.

Reported by our Special Correspondent.

Per ton of 2000 lb. on cars.

Youghiogheny, l'p	$4 40	Columbiana	$3 00
Youghiogheny, nut	3 40	Strip Vein	3 20
Briar Hill, according to quality	$3 85 to 4 00	Mountain Blossburg (blacksmith)	5 50
Massilon	3 65	American Cannel Coal Co.s Cannel	4 50
Hocking Valley	3 25		
Straitsville	3 25		
Anthracite, Lackawanna on cars, Egg			$6 85
" " " " Stove			7 50
" " " " Chestnut			7 00
Youghiopheny Coke, " " here			5 25
Connellsville " " " "			5 50

50 to 75 cents per ton additional for delivery at retail.

Cincinnati, O. Dec. 16, 1874.

Please continue last report.

Per ton of 2000 lb.

	Bush.	Ton.
Youghiogheny, or Pittsburgh, afloat	10 c.	—
Pomeroy coal	7½@8 c.	—
Cannel coal	18c.	—
Semi Cannel	11 c.	—

The following are retail prices delivered:

Youghiogheny	13 c.
Pomeroy	11 c.
Cannel	24 c.
Kanawha Semi Cannel	15c.
Anthracite	$9 50@ —
Foundry coke	10c.
Soft coke	8c.

Detroit, Mich. Dec. 16, 1874.

Specially reported by Messrs. ROBINSON & KEYS, dealers in all kinds of coal.

Our report of last week will answer very well for this. Would like to report something different, but do not expect much improvement before January. Market firm. Quotations unchanged.

Per ton of 2000 lb.

Lehigh Lump, per ton	$10 50	Blossburg	8 50
Lehigh " prep. sizes	10 00	Briar Hill	7 50
Wilkes-Barre, Grate and Egg	9 00	Willow Bank	7 00
Wilkes-Barre, Stove and Nut	9 50	Erie	7 50
		Massillon	7 00

Erie, Pa. Dec. 16, 1874.

Reported by our Special Correspondent.

Wholesale, per ton of 2,000 lb.

Bituminous f.o.b.

Briar Hill lump	$4 00	Beaver lump	$4 00

Indianapolis, Ind. Dec. 7, 1874.

Specially reported by Messrs. H. McCOY & Co.

Per ton of 2000 lb.

BITUMINOUS.

Wholesale on board cars in city.

Best Block coal	$3 10	Indiana cannel	6 75
Best Highland	2 50	Hocking Valley	3 25
Block Nut, per car	20 00	Youghiogheny	6 00
Highland " "	18 00	Blossburg (smithing)	7 30
Block slack, per car load	15 00	Piedmont "	7 75
Peytons, cannel per ton	8 75	Gas coke, ... per bushel	100

ANTHRACITE (Lackawanna).

Grate	$8 70	Chestnut	8 60
Egg	8 70	Stove	8 85

Retail, per bushel of 70 lb.

Block	16c.	Peytona Cannel	32c.
Highland	14	Indiana "	26
Highland Nut, dom. use	12	Youghiogheny	26
Block " "	12	Blossburg	27
Slack, steam, "	8	Piedmont	30
Block & Highl'd Mt. steam	9		

ANTHRACITE.

	per ton.		per ton.
Grate	$11 00	Stove	$11 00
Egg	11 00	Chestnut	11 00

Louisville, Ky. Dec. 15, 1874.

Specially reported by Messrs. BYRNE & SPEED.

The price of Pittsburgh coal in the river is not quite as firm as it was some time since; the retail demand has increased very much since the arrival of last run of coal.

The Rail Roads carrying Kentucky coal have also reduced rates of freight.

Our retail rates are as follows:

Pittsburgh, per load of 1900 lb	$3 50
Pomeroy	
Buckeye Cannel	5 00
Peytona Cannel	5 75
Nut and Slack	2 50
Kentucky lump, per load	
" nut, "	
" Slack "	
City-made Coke, per bushel	10c
Kentucky on cars at wholesale, per bush.	9½
Anthracite, per ton	$10 to $10 50

Milwaukee, Wis. Dec. 13, 1874.

Specially reported by Messrs. R. P. ELMORE & Co.

Retail prices per ton of 2000 lb.

Lehigh Lump	$10 00	Briar Hill, select	$8 50
Lehigh Prepared	10 50	Blossburg	8 00
Lackawanna	9 50	Pittsburgh	7 50

New Orleans, La. Dec. 12, 1874.

Please continue our quotations of 5th inst. No change whatever in the market.

Pittsburgh coal, retail, per bbl	75c
" wholesale	45c.
" to steamboats, per box	60c.
" to manufacturers, per bbl	65c.
" shipments per hhd	$7 00
Anthracite, retail, per ton	$12 50
" wholesale per ton	$8 00
Spadra (Arkansas) coal, retail, per bbl	75c.
Mt. Carbon, wholesale, per bbl	45c.
" retail per bbl	65c.
Virginia Cannel, per bbl	90c.
Scotch Cannel, per bbl	1 00

Pittsburgh, Pa. Dec. 14, 1874.

Reported by our Special Correspondent.

Trade continues very dull. The lock-out of the puddlers, which commenced on Monday, 7th inst., is quite general here, but two or three mills continuing to pay the old price, $6 per ton. Both sides appear determined.

Prices remain unchanged, except Connellsville coke, which may be quoted at $2 50, and Youghiogheny coke at $2 25 per ton.

Sig. GUSCETTI, who had charge of the Italian miners "routed" from ARMSTRONG'S mines on the Connellsville railroad, is endeavoring to have their case investigated by the interference of the representative of the Italian government at Washington, but he might as well "hang his harp upon the willows," as to try to bring the kind of offenders in question to judgment.

Per ton of 2000 lb. and Bushel of 76 lb.

	per ton.		per ton
Youghiogheny coal	$2 00	Pittsburgh retail delivered per bushel	9c@10c
" coke	2 50		
Connellsville coal	2 10	Anth'cite on cars Lehigh	$7 75
" coke	2 75	" " Wilkes-Barre	6 75
Pittsburgh coal	1 85		

Twenty-five to fifty cents per ton additional for delivery.

St. Louis, Mo. Dec. 14, 1874.

Specially Reported by the COLLINSVILLE COAL AND MINING COMPANY.

ANTHRACITE.

Per ton of 2000 lb.

	City delivery.
Lehigh Lump	$13 50
Lackawanna and Wilkesbarre	12 50
Semi Anthracite	9 50

BITUMINOUS.

Per ton of 2000 lb.

	E. St. Louis.	City delivery
Washington Indiana—smithing	$4 00	$4 87
O'Fallon, Ills	2 00	3 00
Collinsville and Belleville, Ills	1 75	2 75
Indiana Cannel	6 00	7 00
Missouri Cannel		5 00

Retail, 25c. per ton additional.

San Francisco.

From the *Commercial Herald* of December 3.

Imports from January 1st to December 1:

Anthracite, tons	11,843	Vancouver Island, tons	46,805
Australian, tons	126,068	Bellingham Bay, tons	13,185
Coos Bay, tons	43,725	Rocky Mountain, tons	343
Cumberland, tons	15,033	Seattle, tons	4,535
English, tons	25,301	Mt. Diablo (10 mos.)	168,182

The market, both present and prospective, is strong, by reason of light shipments making at the Colonies and elsewhere for this port. Imports for the week include the *Garnet's* cargo of Cumberland from Baltimore, 1158 tons; *Blue Jacket*, 1857 tons Wellington from Vancouver Island; steamer *Empire*, 575 tons Coos Bay; *Columbia*, 1260 tons from New South Wales—this cargo, we are told, sold prior to arrival at $10 50; *Favorita*, 1460 tons Scotch from Leith; *Thirlmere*, 2500 do.—also sold to arrive, private; *Loch Cree* from Sydney, 1165 tons; *Herald of the Morning*, 350 tons, etc. We quote Australian spot cargoes at $11@$11 25; Wellington screened, $11@$11 50; Nanaimo, same; Bellingham Bay, $8 50; 1158 tons Cumberland, ex-ship, sold private. The *Andromeda*, from Liverpool, adds 2100 tons to our stock.

Toledo, Ohio. Dec. 14, 1874.

Specially reported by Messrs. GOSLINE & BARBOUR.

Per ton of 2000 lb.

	Retail.		Retail.
Wilkes-Barre and Scranton, Large and Small Egg	$8 35	BITUMINOUS. Blossb'g and Cumberl'd	$8 00
Stove	8 50	Massillon Lump	6 00
Chestnut	8 35	Briar Hill	7 00
Lehigh Lump	10 00	Straitsville	3 75
		Hocking Valley	4 00

Soft coal screened retails from $4 00 to $6 00, according to quality.

Montreal. Dec. 16, 1874.

Reported by our Special Correspondent.

The close of navigation, causing a cessation of all imports for six months, has, as usual, occasioned an advance in price, but only a moderate one, as stocks of coal are large and demand very limited. The course of our market has proved very difficult to forecast, estimates of supply and probable demand having repeatedly been found fallacious. At present the stock of soft coal would seem ample for all contingencies; but though anthracite is in large supply, a cold winter and revival of manufactures might reduce stocks to a small margin before next open water.

The chief sensation with regard to coal has been caused by a fire on the premises of the New City Gas Company. Spontaneous combustion took place in a pile of 7,000 tons of coal from the International Mine, Cape Breton, and an immense conflagration ensued. A speculator bought 1,000 tons of inferior gas coal at an advance of one dollar in price, it being reported that 14,000 tons of coal were consumed. The result, however, proves that the loss is only 1,000 tons, and as the Gas Company need to make no purchases, the market has resumed its former condition. Quotations are:

Per ton of 2,240 lb.

Scotch Steam	$4 50@4 75	Cape Breton Steam	$4 00
Pictou "	4 25	Newcastle Smiths,	5 50

Anthracite at retail, 2,000 lb., delivered, less 5 per cent.

Egg	$8 00	Nut	$8 00
Stove	8 50	Chestnut	7 75

Halifax, N. S. Dec. 14, 1874.

Reported by our Special Correspondent.

We have nothing to add to our advices of last week; prices of coal here continue about the same.

Prices per ton of 2240 lb. in gold.

Sydney (old mines)	$4 50	Little Glace Bay	3 50
Gowrie	3 50	Blockhouse	4 00
Victoria	3 50	Albion (at Railroad)	4 25

Toronto, Ont. Dec. 14, 1874.

Reported by our Special Correspondent.

ANTHRACITE.

	per ton.		per ton.
Broken	$7 65	Chestnut	$7 65
Egg	7 65	Lehigh	9 00
Stove	8 15		

BITUMINOUS.

Blossburgh	7 50	Screenings	5 00
Briar Hill	7 00	Soft Nut	5 50

Freights.

Rates from Elizabethport, Port Johnston, &c., are reported firmer, 90c. and 95c. having been paid from these points to Providence. We note a few inquiries for freights to Boston, with a scarcity of vessels. No change has transpired in Philadelphia or Baltimore and Georgetown rates, and quotations for these points remain nominally as before.

REVIEW OF THE BRITISH COAL AND IRON TRADES.

Compiled from our exchanges bearing date to November 28, 1874.

Though stocks of iron generally throughout England appear light, business is dull, and prices rather receding. Bessemer pig has declined 2/ 6d., or to £4 12/ 6d @£4 15/ at Barrow. The rail mills are doing very little, particularly in Wales, and many large Continental orders have been taken in Belgium and France at very low prices. We hear of a Belgian mill offering to fill an order of 8,800 tons iron rails at £6 18/ f. o. b. in Antwerp; £7 is asked by some of the heaviest makers in Belgium. At these prices the English cannot produce iron rails, but they are under-selling the Belgians in steel rails, which have recently been delivered in Manchester at £9 18/ 4d., while the lowest price at Antwerp is £10.

Tenders for about 18,000 tons of steel ingots, to be delivered at the rate of 1,000 per month, are invited by Belgian rail mills; the price must not exceed £7 13/—ex ship *Antwerp*.

At Middlesbrough, No. 1 pig is 62/; No. 3, 64/; No. 4 forge, 58/@58/ 6d. Manufacturing fuel is quoted at 16/@17/.

There are some 6,000 or 7,000 men unemployed in the North of England.

At Wolverhampton bars are offered at from £95/ to £10 10/; all mine hot blast pigs, £5@£5 5/; cinder pigs, £3 5/. Furnace coal, 11/ per ton.

In Scotland.—The stock in CONNAL'S stores is increasing, being now 32,235 tons. Prices of warrants remained at 84/@ 85/.

IRON MARKET REVIEW.

New York.

Dec. 18, 1874.

American Pig.—As might be expected at this season of the year, the demand is exceedingly light, and the business actually being done is confined to a very few. Some makers are asking $26 for No. 1 iron, but there is an abundance of first class iron offering at $25, with good brands as low as $24, so that those asking the first mentioned figure may be considered out of the market. When pig iron was at $30 a ton, a number of speculators expressed their determination to purchase liberally should it decline to $25; but they must have changed their views, as there appears to be no demand whatever from that source, and it is doubtful if two or three

dollars additional decline would give much activity to the speculative trade. There is little encouragement in view for makers, the same depressing influences that have carried prices to where they are, still hang over the market, and it appears as though it would be almost impossible to make consumers believe that there could be a bottom to prices.

The representatives of the combined coal companies met in this city to-day, and it was supposed that they would act upon the labor question, but they transacted no important business, and adjourned subject to the call of the President of the Board.

We note sales of about 1,200 tons No. 1x. by the Thomas Iron Company, in small lots, at $25 per ton, and 100 tons of another Pennsylvania brand, at the same figure.

We hear of quotations as follows: No. 1 foundry, $24@$26; No. 2, $23@$4; and forge, $21@$23.

Scotch Pig.—We note the sale of 100 tons of Coltness, to arrive, on private terms. The stock continues very light, the arrivals during the week having been quite small. Coltness is quoted at $40@$41, on spot; Glengarnock, $37; and Eglinton, 36; although to arrive, prices are much easier, especially on Coltness.

Rails.—There have been no transactions. American rails are quoted at $48@$53 at the mills, and Bessemer steel at $75 @$80.

Old Rails.—We note the sale of 1,500 tons to a Western mill, at $30 per ton, short time, delivered. Quotations are $29@$30

Scrap Iron.—There have been no transactions, and quotations may be given at $28@$30.

Boston.

From the *Commercial Bulletin* of Dec. 12, 1874.

Pig is as listless as it has been at any time since its stupid temper began six months ago. The Philadelphia meeting on Thursday made no impression here, as No. 1 iron has been selling at $28, and No. 2 at $26 on our own wharfs, just about New York prices, and has been apparently away from the control of what it costs to produce and land here. The large foundries that have been buying are not apparently anxious to purchase at the above figures, while the sellers manifest outward indifference to accepting less than $31@33 for No. 1 and $28 50@31 for No. 2, but a round lot of good No. 1 changed hands and is on its way to consumption at $27 50. It's easy figuring to convince that such prices pay an outrageous loss but it does not alter the fact that somebody is footing them.

Cleveland. Dec. 16, 1874.

Specially reported by Messrs. C. E. BINGHAM & Co., dealers in pig iron and iron ore

You will note below a decline of about $1 per ton, as compared with last weeks' prices.

No. 1, Bituminous	"	29 00@ ...
No. 2,	" "	27 00@....
No. 1,	" Gray Forge	25 00@....
No. 1, Lake Superior Charcoal		31 00@....
No. 2,	" "	29 50@....
No. 3,	" "	32 00@....
No. 4,	" "	33 00@....
Nos. 5 and 6	"	34 00@....
American Scotch, No. 1, Cherry Valley		33 00@....
" " No. 2		30 00@....

Cincinnati. Dec. 15, 1874.

Specially reported by Messrs. TRABER & AUBERY, commission merchants for the sale of pig iron, blooms, ore, etc.

We notice a better demand for pig iron during the past week, and some sales of round lots are reported. There is no improvement, however, in prices, and quotations of all but the best brands foundry iron must be regarded as nominal.

CHARCOAL.

Hanging Rock, No. 1, Foundry	$29 00@30 00	4 mos
" No. 2, "	27 00@28 00	4 mos
" Mill	25 00@26 00	4 mos
Tennesse No 1, Foundry	27 00@28 00	4 mos
Tennessee. No. 2 "	26 00@27 00	4 mos
" Mill	25 00@	4 mos
Missouri, No. 1, Foundry	30 00@32 00	4 mos

STONE COAL.

Ohio No. 1, Foundry	27 00@28 00	4 mos
" No. 2, "	26 00@27 00	4 mos
Ohio Mill	24 00@25 00	4 mos
Missouri, No. 1, Foundry	29 00@30 00	4 mos
" No. 2, "	27 00@28 00	4 mos
" Mill	25 00@26 00	4 mos

CAR-WHEEL.

Hanging Rock, C. B	50 00@52 00	4 mos
Tennessee "	45 00@48 00	4 mos
Missouri "	45 00@48 00	4 mos
Alabama "	45 00@48 00	4 mos

BLOOMS.

Charcoal	75 00@ 90 00	cash

SCRAP IRON.

Cast	75@ 1 00	cash
Wrought	1 25@ 1 50	cash

Indianapolis, Ind. Dec. 14, 1874.

Specially reported by NELSON KINGMAN, broker and dealer in pig iron, etc.

Continue quotations.

New Rails at mill	$56 00@58 00	
Old Rails "	28 00@30 00	
Hanging Rock Charcoal Pig No. 1 foundry	31 00@32 00	4 mos
" " " " " 2 "	29 00@30 00	4 mos
" " " Mill	27 00@28 00	4 mos

STONE COAL.

Indiana No. 1 Foundry pig Planet furn'e.	32 00@33 00	4 mos
" 2 " " "	30 00@32 00	4 mos
" 1 Forge " "	29 00@	4 mos
" 2 " " "	27 00@	4 mos
Ohio No. 1 Foundry pig	30 00@31 00	4 mos
" 2 "	29 00@30 00	4 mos
" 1 mill	26 00@27 00	4 mos
Merchant Bar, card rates	per lb. c. 2,60	

1st quality C. H. No. 1 Boiler Plates, per lb	5¾c.	3 mos
1st " Com. Sheet, for No. 24, W.G. "	4½c.	3 mos
1st " Charcoal Sheet " " "	6 c.	3 mos
Best Bloom Galvanized Sheet, discount 20 per cent		cash.
2d quality " " " 30 "		cash.

f. o. b in Indianapolis.

Louisville. Dec. 15, 1874.

Specially reported by GEORGE H. HULL, Esq.

The market is dull and lower. Purchasers continue to confine their purchases to what they have immediate use for, and the sales, in consequence, are not large.

The usual time, 4 months, is allowed on the quotations below.

HOT BLAST—CHARCOAL.

No. 1 foundry, from Hanging Rock ores		$28 00@30 00	
No. 2 "	" "	26 00@27 00	
No. 1, forge,	" "	24 00@25 00	
No. 1, foundry,	" Tennessee "	26 00@28 00	
No. 2 "	" "	25 00@26 00	
No. 1, forge,	" "	24 00@25 00	
No. 1, foundry,	" Alabama "	26 00@28 00	
No. 1 "	" Iron Mountain "	28 00@30 00	

HOT BLAST—STONECOAL.

No. 1, foundry, from Missouri ores		29 00@30 00	
No. 2, "	" "	28 00@29 00	
No. 1, forge	" "	27 00@28 00	

COLD BLAST—CHARCOAL.

Wheel from Hanging Rock ores		40 00@50 00	
" "	Tennessee "	36 00@38 00	
" "	Alabama "	40 00@42 00	
" "	Georgia "	40 00@42 00	
" "	Missouri "	40 00@42 00	
" "	Kentucky "	40 00@42 00	

Milwaukee, Wis. Dec. 14, 1874.

Specially reported by Messrs. R. P. ELMORE & Co.

Per ton of 2,240 lb.

Scotch ranges		$40 00 to	$45 00
No. 1, Lake Superior Charcoal		36 00 to	8 00
" 2, "	"	34 00 to	36 00
" 1, "	" Anthracite	35 00 to	36 00
" 2, "	"	33 00	

Pittsburgh, Pa.

From the *American Manufacturer* of Dec. 16, 1874.

PIG IRON.

Trade in pig iron since the inauguration of the lock-out has been almost entirely suspended; it was very meagre before the strike, but now, with nearly all the puddling furnaces standing idle, the mills, as might be expected, are entirely out of the market; furthermore, it is doubtful, even if the strike was ended, whether there would be much, if any improvement in the demand, as stock-taking time is near at hand, and consumers as a rule make it a point to have as little stock then as they can possibly help. There has been an increased demand for muck bar; the sales reported since the date of our last report aggregating some 2000 tons, at prices ranging from $39@$42 per ton. Some of our mills, with an eye to business, accumulated a considerable stock of muck bar before the strike, which it is alleged can be laid down here from other points, with freight and other expenses added, cheaper than it can be made. In regard to prices of pig iron it is difficult, in the absence of sales, to give quotations, but, as might be expected, the general tone and spirit of the market is still in buyers' favor, and there is not much doubt but that mill iron could be bought lower now than just after the panic. Small sales of bituminous foundry irons are reported at $25@$26, 4 mos., showing a decline of $1@$2 per ton within the past few weeks, and gray forge may be quoted nominally at $23@$24. The only encouraging feature apparent in the present depressed and demoralized condition of the market is that it will, providing the lock-out continues any length of time, result in a diminished production; it will have a great deal more influence in causing furnaces to blow out than all the conventions that have assembled for that purpose since the panic.

MANUFACTURED IRON.

The general position of the market for all kinds of finished iron has not changed much since the date of our last review; business continues dull, as it nearly always is at this particular time, orders are coming in sparingly and are mostly small, as the demand is restricted entirely to supplying immediate wants, and it is not expected that there will be any decided or permanent improvement until the latter part of January, when the spring trade generally commences to open up. The majority of the mills, with the exception of their puddling departments, are in operation, but the most of them are working short time. Prices are irregular and unsettled, so much so that it is difficult to give quotations, but the general tone and spirit of the market is still in buyers' favor. We notice that some of our eastern exchanges indulge in hopes that the lock-out here will inure to the benefit of the eastern mills, but we will take occasion to state that our mills are taking orders as usual, and will continue to do so, notwithstanding the strike, as they are generally well stocked with muck bar, and, as we have already stated, are running as usual.

LATER—CARD REDUCED—At a meeting of the Iron Association on Tuesday, 15th inst., it was decided to reduce the card half a cent. per lb., which brings merchant bars down to 2½ cents, and the actual selling price to two and three-tenths. The reduction is in fact no reduction, as the card has not been adhered to for a couple of months or more. Our list, which will be found elsewhere, has been revised and corrected to correspond with the change.

PIG METAL SALES FOR THE WEEK ENDED DECEMBER 16, 1874.

BITUMINOUS COAL SMELTED FROM L. S. ORE.

75 tons No. 1 foundry		$27 00	4 mos
40 " No. 1 foundry		26 00	4 mos
100 " gray forge		23 00	4 mos
100 " gray forge		P. T.	

CHARCOAL.

20 tons No. 1 foundry, H. B		$33 00@$34 00	4 mos
250 " No. 1 foundry, L. S		30 00	cash.
10 " cold blast		52 00	4 mos

MUCK BAR.

300 tons, R. S		$44 00	4 mos
310 " N		44 00	4 mos
200 " N		42 50	cash.
100 " N		42 00	cash.

San Francisco.

From the *Commercial Herald* of Dec. 3.

Exports for the week include 165 tons copper ore to Liverpool per *Derbyshire*; the *Valparaiso* for New York carried 60 tons Selby's refined pig lead, 108 tons chrome ore, and 64 tons copper ore. The market for pig iron is strong; spot parcels of Scotch we quote at $45@$47 50; Oregon, $46 per ton. In Manufactured Goods, there is a light business doing at steady prices.

METALS.

NEW YORK, Dec. 18, 1874.

Gold Coin.—During the week past, gold has ranged from 110¾ to 111¾, and closed yesterday at 111½.

Bullion.—Fine silver bar is quoted at $1 26½@$1 27½, gold, per ounce, and fine gold bar at par ($20 67, gold, per ounce.)

Copper.—The market has been very quiet during the past week, the sales aggregating about 200,000 lb., spot, at $23½c. Very little business is expected before the middle of January, as consumers will not purchase more on this year's account than their urgent necessities require. For Lake Copper 23½c. is being asked on spot and 24c. for future delivery. Baltimore is held at 23½c. on spot, and 25c. for future delivery. These figures have a tendency to throw the latter temporarily out of the market. The latest London quotations, by cable, are Chili bars £85, and best selected £96.

Tin.—We note the sale of about 1,200 slabs of Straits at 22@ 22¼c., gold, part to arrive. With a light stock, the market is very firm at 22½c. for Straits; L. and F. 21¾@22c; refined, 22c.; and Banca, 26@26¼c. The latest London quotations, by cable, are L. and F. £98@99; Straits, £94; and refined, £99. At the present time there is not much doing in tin plates, but since the date of our last review there has been some business. The market is very firm at $9¾@10 for charcoal tins; $8¼@9 for charcoal ternes; $7¾@8 for coke tins; and $7@7¼ for coke ternes. The English market is reported to have advanced from 2/@3/ per box, owing to the late heavy purchases on American account.

Lead.—The sales during the past week did not aggregate over 100 tons of domestic. One outside lot of 50 tons sold at $6 15, and the balance at $6 20, gold, which is the quotation today. Foreign is quoted at $6¾c., gold, with a rising tendency, and but light stock. Selby has increased in stock about 200 tons, and is being held at $6 35, gold, with no business. It is reported that two lots of this lead, which were on the way here, have been lost, the amount being about 250 tons. The Government continues to ask 6¾ 35, and in consequence is doing no business.

Spelter and Zinc.—There is nothing doing in spelter, which is quoted at 6¾c.@7¼c., gold for foreign, and domestic at 6¾c.@6¾c., currency. There is a little business doing in sheet zinc, which is firmly held at 9¼c @9¾c., gold.

Antimony.—There is but little in the market, and it is being held at 12¾ c. gold.

Manganese.—There is no pyrolusite in the market. N. B. manganite is quoted at 3c. gold, per lb.; Georgia, 2½c.; and Virginia psilomelane, 2c.

Quicksilver.—This article is without change, the quotations being $1 65 per lb. in this city; $1 55 in San Francisco, and £26 per flask (75 lb.) in London. The Calistoga *Free Press* says: "The Borax Company is now constructing a Knox and Osborne furnace, a Walbridge furnace, and a bench of retorts. When these are completed it is expected the mine will produce 100 flasks of quicksilver per day. The new cut exposes excellent cinnabar, and the supply of ore seems almost inexhaustible."

Miscellaneous Stocks.

NEW YORK, Dec. 18, 1874.

We have no improvement to note in the following list. The dealings during the week have been limited, and all within a shading on our quotations. The transactions of yesterday's operations of the Board here were comprised in the following, at our quotations: 2,200 shares of Delaware, Lackawanna and Western, 210 shares of New Jersey Central, and 200 shares of Quicksilver. We note a transfer of N. J. Central 1st mortgage coupon bonds, amounting to $14,000, at 102¼. The St. Louis and Iron Mountain Co.'s 1st mortgage bonds recently changed hands at $92. The Philadelphia market on the 16th inst. was comparatively devoid of animation. The most important feature during the day's transactions was a transfer of 4,300 shares of Lehigh Navigation at from 48¾ to 48½. Lehigh Valley RR. sold in small amounts during the day at 62; R. C. and I. Co.'s debenture 6s at 80; Pa. and N. Y. Canal 7s at 104, and Schuylkill Nav. 6s, 1882, at 90.

New Jersey Central R. R. Co	—	107¼
American Coal Co	—	61
Maryland Coal Co	—	19
Pennsylvania Coal Co	—	243

Quicksilver Mining Co. Preferred	—	45
" " " Common	—	34
Reading R. R. Co.	—	55
Delaware and Hudson Canal Co.	—	—
Lehigh Coal and Navigation Co.	—	48¾
Lehigh Valley R. R. Co.	—	61⅞
Catawissa Preferred	—	39⅞
Delaware, Lackawanna & West. R.R.Co.	—	108
Consolidated Coal Co.	—	47
Little Schuylkill R. R.		48¼
Huntington & Broad Top R. R. prefrd.	—	12
St. Louis & Iron Mountain	—	26⅛
Susquehanna Canal	—	6
Delaware Division Canal	—	—
Spring Mt. Coal Co.	—	65
Cumberland Coal and Iron Co.	—	48
N. Y. & Nova Scotia Iron Co.	—	116

Boston Stock Market.

BOSTON, Dec. 17, 1874.

The dealings in Copper Stocks in the Boston Stock market have been comparatively limited during the operations of the week. We note a slight decline in Calumet and Hecla, and also of Allouez. The remaining portion of the list exhibits an advance. 100 shares of Central changed hands during yesterday's operations of the Board, at from $27 to $27½ per share. 50 shares of the Quincy Mining Company were disposed of at $45 per share. We also note a few transfers of Calumet and Hecla at $138 per share. The report is as follows:

Allouez	10	Pewabic	—
Calumet and Hecla Co.	137¾	Phœnix	—
Copper Falls	12½	Quincy	44½
Central	27	Ridge	7
Franklin	—	Rockland	1

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, December 17, 1874.

The following report from the San Francisco Stock Board is dated the 16th inst. With but few exceptions the list continues to advance. Savage shows an improvement of $23; Chollar, $19; Yellow Jacket, $12 per share, while Consolidated Virginia and California are respectively $65 and $50 per share higher than reported a week ago. It is confidently predicted that these two last named items will advance to $500 per share. The Comstock lode is but just beginning to develop its wonderful riches, and the deeper the mines are penetrated the more valuable do the deposits of the precious metals become. No doubt the success of these discoveries is due to the great strides that have recently been made in the improvements of our mining machinery, without which a great deal of the deep mining which is now carried on with comparative ease, would be impossible. We note a decline of $10 per share in Crown Point, and also $6 per share in Overman. A dividend of $3 per share has been declared by the Belcher Mining Co., payable Dec. 10th. The Eureka Consolidated Mining Co. also declared a dividend of 50c. per share, payable on the 5th inst. We note assessments of the Chollar and the Imperial Mining Cos. of $5 and $1 per share, respectively, delinquent December 18th and 29th.

Gould & Curry	32	California	280
Savage	116	Overman	69
Chollar Potosi	76	Raymond & Ely	23
Ophir	99	Eureka C. V	8
Hale and Norcross	58	Best & Belcher	33
Crown Point	47	Kentuck	21
Yellow Jacket	146	Meadow Valley	6
Belcher	45	Alpha	25
Imperial	16	Sierra Nevada	16
Consolidated Virginia	290	Union Consolidated	51

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. The ENGINEERING AND MINING JOURNAL, which is the Organ of the Institute, and contains its proceedings, transactions and notices of meetings, will be sent to each Member and Associate on the payment of his annual dues. Back numbers cannot, as a rule, be sent.

II. Dues (ten dollars per annum) are payable on election and at the annual (May) meeting. Members and associates elected at the February meeting pay ten dollars only to May of the following year. Remittances should be made, as far as possible, by P. O. Order, payable to the Secretary.

III. The Council earnestly requests members to forward to the Secretary, for preservation, copies of all printed mining and geological reports, particularly pamphlets, which may fall in their way. It is believed that by this means a large amount of valuable fugitive information concerning different regions and properties in this country, may be caught and preserved.

IV. Blank proposals for membership can be had on application to the Secretary.

V. The first volume of Transactions of the Institute will be sent by the Secretary to any address, on the receipt of five dollars.

VI. Members are earnestly requested to inform the Secretary promptly of any change of address.

THOMAS M. DROWN, Secretary, Lafayette College Easton, Pa.

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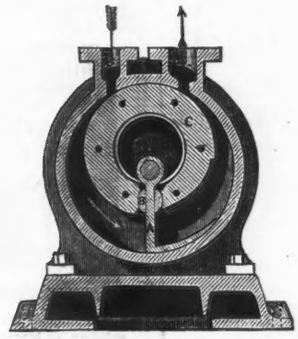

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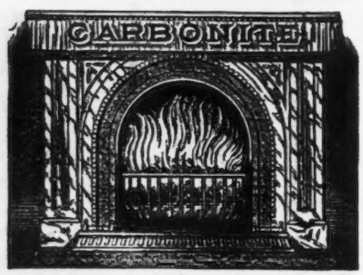

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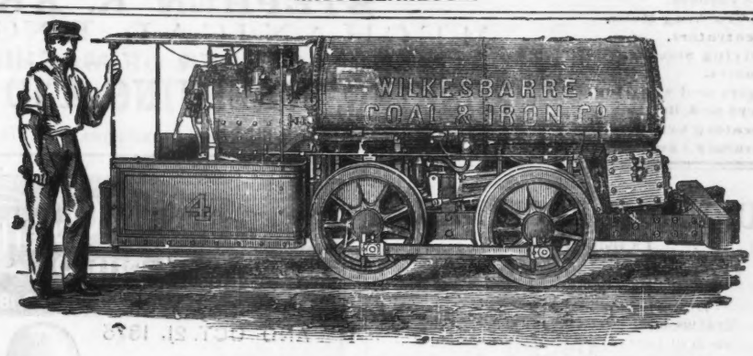

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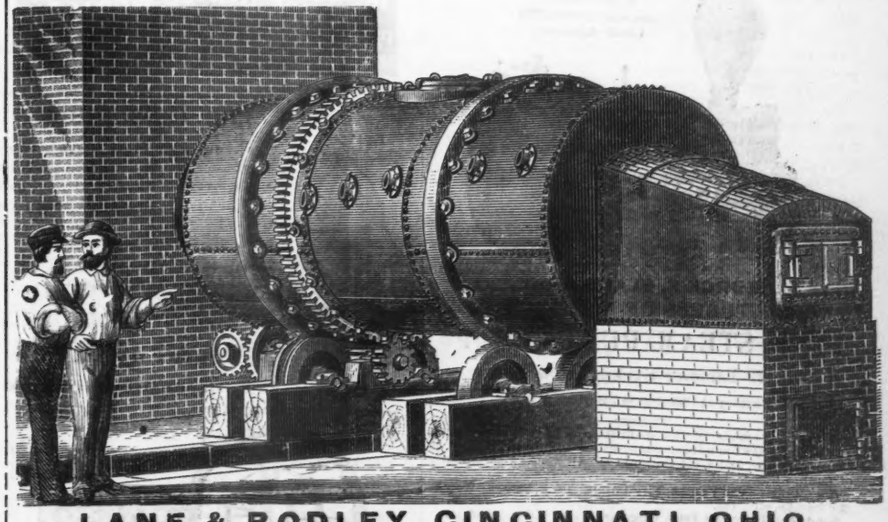

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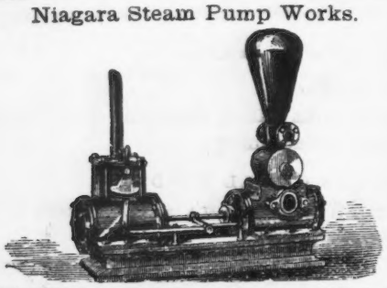

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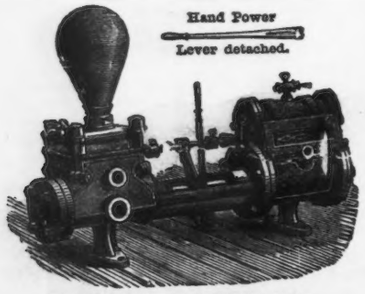

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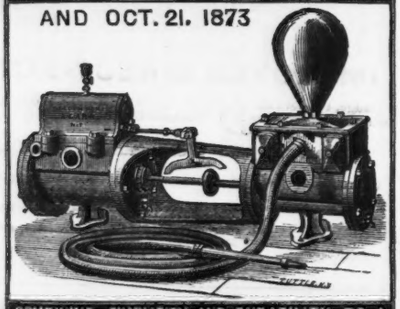

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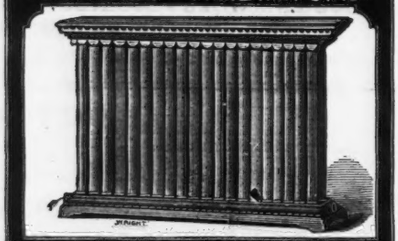

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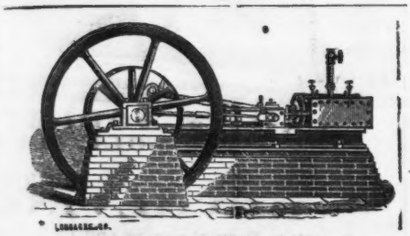

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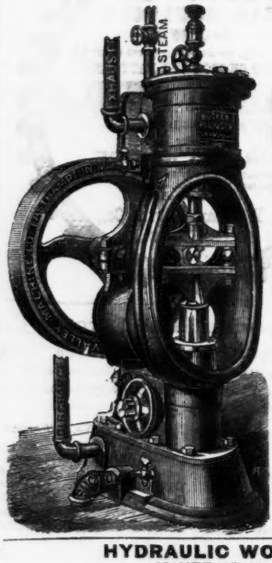

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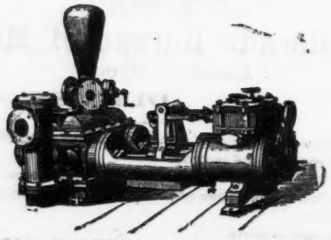

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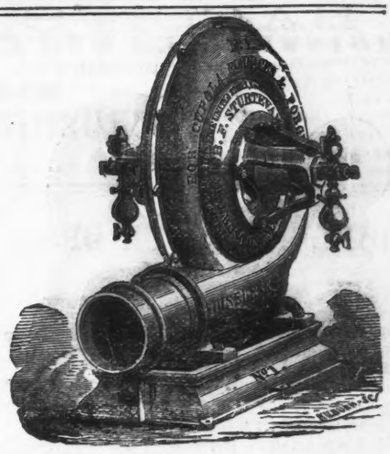
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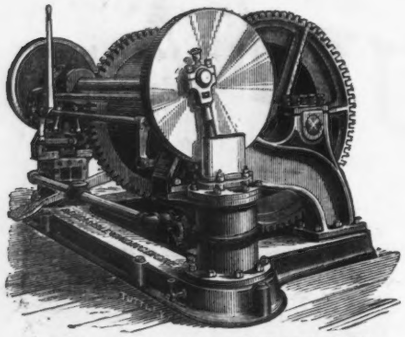

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☞ Look at following extract, Ingersoll Co.'s letter of excuses, ENGINEERING AND MINING JOURNAL, June 6, and compare with their advertisement: "I had *two* drills at the mine from the commencement, one beginning work on the 4th of April, the other on the 7th of the same month, and both drills working until the 1st of May." Signed, C. N. ELLIOTT, Superintendent Ingersoll Rock Drill Co.
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